AN ANALYSIS OF THE CHANGE OF ACTUARIAL COST METHODS FOR PENSION ACCOUNTING AND FUNDING

By

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This study identifies reasons that motivate companies to switch actuarial cost methods used for both accounting and funding purposes. The specific switch of interest is from a method of the cost-allocation family to a method of the benefit-allocation family incurring at the earlier years of a pension plan. The effect of such a switch is a decrease in pension expense, i.e., an increase in earnings per share, and a decrease in the amount funded since switch firms fund as they accrue pension expenses.

Reasons motivating the switch of actuarial cost methods were suggested by both the "pecking order" theory and the agency theory. "Pecking order" theory suggests that actuarial cost method switch firms needed to increase the amount of internally available funds in comparison with other firms. Agency theory, on the other hand, suggests that actuarial cost method switch firms are not adversely affected by higher agency costs in comparison with other firms.

Two samples of other firms were used in the comparisons with switch firms (1) randomly selected firms and (2) industry matched nonswitch firms. The comparisons were performed by using univariate and multivariate tests on a cross-sectional and a time-series basis. The time-series basis involved the year prior to, the year of, and the year after the switch.

Results indicate that switch firms needed to improve expansion and liquidity. Moreover, switch firms had more assets available for the satisfaction of their pension liabilities than nonswitch firms, a condition facilitating the switch of actuarial cost methods.

Comparisons of switch with random nonswitch firms indicate that switch firms were able to improve their earnings performance in the year of the switch. Management may have benefited from such an improvement if there were compensation plans tied to earnings. On the other hand, comparisons of switch with industry matched nonswitch firms show that switch firms had lower debt capacity than nonswitch firms. Hence, the switch represents an attempt of switch firms to increase their debt capacity and avoid certain agency costs. The low political visibility of switch firms seems to be also a condition facilitating the switch of actuarial cost methods.

CHAPTER I
INTRODUCTION

1.1 Motivation

One of the main issues considered in the Financial Accounting Standards Board (FASB) project "Employers' Accounting for Pensions" is the choice of the appropriate actuarial cost method(s). Several actuarial cost methods have been used for both accruing periodic pension expenses and determining the funding of pension plans. These methods can be classified into two general categories: (1) benefit-allocation methods and (2) cost-allocation methods.

Benefit-allocation methods allocate the benefits of the plan to the various plan years and then determine the cost of these benefits. Cost-allocation methods, on the other hand, allocate to the various plan years the costs of prospective benefits without directly allocating benefits.

The primary difference between these two classes of methods is that cost-allocation methods lead to the accumulation of a larger amount of resources for the satisfaction of pension benefits than benefit-allocation methods. Moreover, cost-allocation methods assign a large amount of normal costs to the early years of a pension plan, while benefit-allocation methods allocate large amounts of normal costs to the later years of the pension plan.

As a result, the long-term normal cost is lower under any of the various cost-allocation methods than it is under any of the benefit-allocation methods.

Although a firm may initially select a particular cost-allocation method, it may later switch to a benefit-allocation method. By selecting the appropriate time for the switch, a firm can simultaneously achieve a decrease in pension expense (i.e., an increase in earnings per share) and, since most firms use the same method for accounting and funding purposes, a decrease in cash outflows for pensions. However, this effect will be observed only in the short-run. In the long-run, the firm will have a higher normal cost under a benefit-allocation method. Hence, the primary research question that arises is "Why do companies switch to an actuarial cost method that generates a higher long-term normal cost?" Furthermore, by switching actuarial cost methods, not only can firms reallocate pension expenditures among accounting periods, but they can also affect the total amount of assets accumulated in the pension plan.

The substantial decrease of pension costs over a given period of time may have motivated the switch. The switch, however, may also be associated with contemporaneous changes in production and/or financing decisions of the firm. Empirical evidence supporting these changes would indicate the informativeness of actuarial cost methods. As a result, disclosure of the actuarial cost methods used for funding purposes, and any changes in these methods, may lead to more informative financial statements. The FASB exposure draft on "Employers' Accounting for Pensions," though, does not require disclosure of the actuarial cost method used for funding purposes.

The purpose of this study is to develop and test a theory explaining the switch from a cost-allocation to a benefit-allocation actuarial cost method. The development of the theory rests on arguments relevant to the choice of internal versus external sources of financing (Modigliani and Miller [1958, 1963], Robichek and Myers [1966], Jensen and Meckling [1976], Myers [1977], Miller [1977], DeAngelo and Masulis [1980], and Myers [1984]). This theory suggests that less politically visible firms with more pension assets available for the coverage of their pension liabilities switch actuarial cost methods to improve financial/ investment positions and profitability in comparison with other firms. The implications of the theory are tested by using univariate and multivariate procedures.

The remainder of this chapter is devoted to a discussion of certain features of the institutional environment about pensions. This discussion will provide the background for identifying reasons motivating the switch of actuarial cost methods.

1.2 Institutional Environment and Pensions

Pension plans can be classified into defined benefit plans or defined contribution plans. Defined benefit plans promise employees a specific amount of benefits starting at retirement. A professional actuary usually determines how funds will be contributed to the pension plan so as to satisfy these defined benefits. Defined contribution plans, on the other hand, specify that a certain amount will be contributed by the employer and the employee. This type of plan does not promise any specific benefits to the employees other than the funds accumulated on their behalf at the moment of their retirement.

Funding of defined benefit plans is a complicated process involving several assumptions concerning future events, e.g., employees turnover rates, interest rates, and compensation levels. The passage of the Employee Retirement Income Security Act (ERISA) in 1974 has greatly affected the funding aspects of pensions. The accounting aspects of pensions, on the other hand, are governed by Accounting Principles Board (APB) Opinion No. 8 [1966] and Financial Accounting Standard Board Statement No. 36 (FASB No. 36 [1980]).

1.2.1 Pension Funding

The Employee Retirement Income Security Act (ERISA) specifies vesting and funding requirements that a pension plan must meet to be "qualified." A qualified pension plan enjoys a tax-favored status in that (1) contributions by the employer to the plan are deductible for tax purposes and (2) no taxes are paid on income earned from plan assets until disbursed to the employees.

The amounts paid into the pension plan by the employer must include (1) normal cost, i.e., the actuarial present value of benefits allocated to the current year, (2) interest on unfunded amounts, (3) a portion of the unfunded amounts arising from benefits associated with services performed prior to the establishment of the plan, i.e., a supplemental cost, and (4) a portion of the unfunded benefits arising from plan amendments (also a supplemental cost). The computational details about each of these items are discussed in the following chapter.

Normal costs and amounts of assets that should have been funded are determined by the actuarial cost method used for the computation of the pension costs of the plan. Changes in actuarial cost methods require the approval of the Secretary of the Treasury.

The IRS has interpreted ERISA as requiring the same assumptions and funding methods for both funding and tax deduction purposes. The maximum annual deduction is generally based on the normal cost of the current year plus an amount necessary to amortize unfunded normal costs of prior years over a ten year period (approximately ten to fourteen percent of the unfunded prior normal costs). A lower deduction is possible if an employer chooses to amortize prior unfunded normal costs over a period longer than ten years but no more than thirty years. Any losses arising from unrealized estimates, i.e., experience losses, must be amortized over a period not exceeding fifteen years.

There is an upper limit on the amount of funds that must be accumulated in the pension plan. This is equal to the sum of all prior normal costs plus interest on these costs minus benefits arising from withdrawals of participants from the plan. This sum is known as the actuarial liability or accrued liability or asset target and it is determined by the plan's actuarial cost method.

The Secretary of the Treasury may waive all or part of the minimum funding requirement for a specific year. This can happen if contribution of the minimum amount required imposes substantial business hardship upon the employer and impairs the interests of the employees. The Employee Retirement Security Act, however, limits waivers to a maximum of five years out of any fifteen consecutive years. In addition, the amount waived must be amortized over the fifteen consecutive years.

Another major contribution of ERISA was the establishment of the Pension Benefit Guarantee Corporation (PBGC) to guarantee part of the vested benefits in the event of termination of an underfunded plan. The PBGC has the power to impose a liability on the employer up to thirty percent of its net worth. This liability may be enforced by a priority lien, and the net worth of the employer is usually measured by the market value of its common stock. The ERISA allows the day of equity valuation to be any of the one hundred and twenty days preceding termination of the plan.

Until 1980, employers were allowed to purchase insurance from the PBGC against their liability (to the PBGC) in the event of plan termination. Under such circumstances, moral hazard problems can very easily arise. The Multiemployer Pension Plan Amendments Act of 1980 repealed the provisions of ERISA that provided for the purchase of insurance from the PBGC against employer liability to the PBGC.

1.2.2 Pension Accounting

Since 1972, Accounting Principles Board Opinion No. 8 has provided the guidelines for the determination of annual pension expense. This expense must be within the range of a minimum and a maximum. APB Opinion No. 8 requires a minimum annual expense equal to the total of (1) normal cost for the current year, (2) interest on any unfunded normal costs from prior years, and (3) a supplemental provision for vested benefits, if that provision is necessary. The maximum annual expense is defined in APB Opinion No. 8 as equal to the total of (1) normal cost for the current year, (2) 10% of the unfunded normal costs from prior years arising on the inception of the plan and on plan amendments, and (3) interest equivalent on differences between amounts expensed and funded.

According to APB Opinion No. 8, normal cost can be determined under any acceptable actuarial cost method except the pay-as-you-go and the terminal funding methods. The actuarial method used for accounting purposes does not have to be consistent with the actuarial method used for funding purposes, although most companies use the same method for both accounting and funding purposes (FASB, Exposure Draft [1985], p. 23).

Financial Accounting Standards Board Statement No. 36 requires that the amount of accumulated plan benefit based on current compensation levels be disclosed. In essence, FASB Statement No. 36 promulgates the use of one actuarial cost method, which is based on accumulated benefits, for the computation of pension liabilities. Most companies, however, use another actuarial cost method for funding purposes (FASB, Exposure Draft [1985], p. 65). Moreover, FASB Statement No. 36 requires that companies disclose interest rates and market values of assets accumulated in the pension plan.

1.3 Organization

Chapter II contains a detailed presentation of the measurements associated with each actuarial cost method. This chapter also examines the effects of the switch of actuarial cost methods from an actuary's point of view. Moreover, reasons for the initial selection of a method from the cost-allocation family of methods are offered.

Chapter III examines some of the literature relevant to this study. The purpose of this chapter is to provide a theoretical and empirical foundation for the identification of the factors that may have motivated the switch. This chapter includes (1) a general review of pension related issues, (2) an exposition of certain theories examining the costs affecting the choice between external and internal sources of financing, and (3) an examination of the primary theories that have been tested in accounting method choice research.

Chapter IV addresses reasons that may have motivated the switch of actuarial cost methods and derives testable hypotheses from the theoretical and empirical research of the previous chapter. The two major hypotheses are (1) actuarial cost method switch firms needed to increase their internally available funds, and (2) actuarial cost method switch firms were not adversely affected by higher agency costs.

The empirical procedures that will be used to test the reasons motivating the switch are detailed in Chapter V. These procedures are multivariate and univariate, time series and cross-sectional. Moreover, this chapter will address certain data-collection and measurement considerations.

Chapter VI presents the empirical results of the study. An important finding is that actuarial cost method switch firms needed to increase their internally available funds and improve their expansion which is consistent with the "pecking order" theory. The pension plan position of switch firms seems to facilitate such a decision. Specifically, switch firms have more assets available for the coverage of their pension liabilities than other firms. Moreover, switch firms were able to improve earnings performance and to an extent avoid certain agency costs associated with lower debt capacity without increasing their political visibility. Thus, the switch of actuarial cost methods is also consistent with agency theory.

Finally, in Chapter VII, certain conclusions are drawn based on the empirical findings. Moreover, the limitations of the study are examined, and the implications for future research are stated.

CHAPTER II
ACTUARIAL COST METHODS

Actuarial cost methods have been classified by actuaries (McGill [1981], Winklevoss and McGill [1979]) into two broad categories: benefit-allocation, and cost-allocation methods.

The most common benefit-allocation methods are the (1) Accumulated-Plan-Benefit-Method (APBM), which is also known as the unit credit method or the accrued benefit method; (2) Level-Dollar-Benefit-Method (LDBM); and (3) Level-Percentage-Benefit-Method (LPBM). The last two methods also appear under the names projected-unit-credit methods and modified accrued-benefit methods.

The most common cost-allocation methods are (1) Level-Dollar-Cost-Method (LDCM) and (2) Level-Percentage-Cost-Method (LPCM). Both methods are also known with the names entry-age normal methods and projected-benefit-cost-methods.

Three important measurements are associated with each method--normal cost (NC), asset target (AT), and supplemental cost (SC). All three items are discussed below for all of the five methods. In general, benefit-allocation methods compute normal costs and asset targets based on benefits allocated to individual plan participants. In contrast, cost-allocation methods allocate the costs of projected benefits in determining the normal cost and asset-target of a pension plan.

2.1 Normal Cost

In the case of benefit-allocation methods, normal cost is equal to the actuarial value of benefits allocated to each employee for the work of the current year.

Under the Accumulated-Plan-Benefit Method (APBM) normal cost for an individual is computed as follows:

Normal cost for the current year	=	Benefits allocated to current year	x	Probability of surviving in employment to retirement	x	Discount factor from retirement to current year	x	Life annuity factor for $1 per year starting at retirement
		(1)		(2)		(3)		(4)

Benefits allocated to employees for the current year are equal to the increase in each employee's accumulated plan benefits during the year. The benefits allocated to the current year of service are determined by direct application of the plan benefit formula. The simplest case is when the benefits for the current year are measured by a flat dollar amount. Benefits can also be a specified percentage of the participant's career average compensation or of the final five years average compensation.

Normal cost under Level-Dollar-Benefit-Method (LDBM) is computed in the same way as in the APBM except for factor (1). This factor becomes the projected annual benefit at retirement divided by career years of service.

Under the Level-Percentage-Benefit-Method normal cost is also computed as in the APBM except factor (1) which is equal to

$$\frac{\text{Projected annual benefit at retirement}}{\text{Career salary}} \times \text{Salary of the current year}$$

Under all three benefit allocation methods, factors (1), (2), and (3) of the right-hand side of the formula for computing normal costs will increase with age, while factor (4) will remain constant (unless the plan itself changes). Hence, the normal cost for an employee will progressively increase during his career.

Normal cost under the Level-Dollar-Cost-Method (LDCM) is equal to a fixed amount throughout the employee's career. This amount is computed into two steps. First, the total cost of projected benefits is computed as follows:

$$\text{Total cost of projected benefits at entry age} = \text{Projected annual benefit at retirement} \times \text{Probability of surviving in employment from entry age to retirement} \times \text{Discount factor from retirement to entry age} \times \text{Life annuity factor for \$1 starting at retirement}$$

The total cost of projected benefits is also known as actuarial present value of projected benefits or present value of future benefits. The projected annual benefit payable at retirement is the sum of benefits credited to each of the years of employment.

Once total cost of projected benefits has been computed, normal cost can be computed from the following relationship:

$$\begin{array}{lclcl} \text{Total} & & \text{Normal} & & \text{Temporary} \\ \text{cost of} & = & \text{cost} & \times & \text{annuity} \\ \text{projected} & & \text{under} & & \text{from entry} \\ \text{benefits} & & \text{LDCM} & & \text{age up to} \\ \text{at entry} & & & & \text{retirement} \\ \text{age} & & & & \text{for \$1} \end{array}$$

Since the LDCM normal cost is computed as a level annual dollar cost, it is larger than the normal cost developed under benefit-allocation methods during the early years of the pension plan.

In the case of Level-Percentage-Cost-Method (LPCM), normal cost is a fixed percentage of the employee's annual salary throughout his whole career. As in the LDCM, the total cost of projected benefits at entry age is computed initially. Subsequently, the normal cost can be computed from the following relationship:

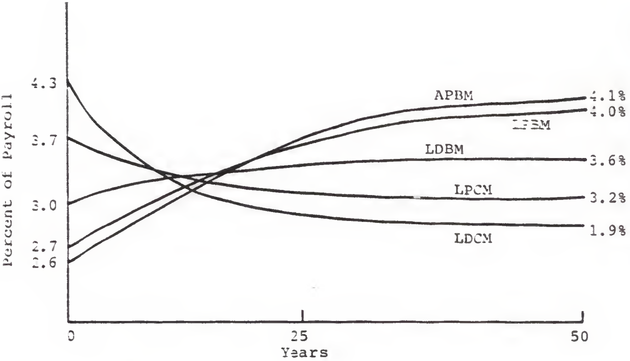
$$\begin{array}{lclcl} \text{Total} & & \text{Normal} & & \text{Actuarial} \\ \text{cost of} & = & \text{cost} & \times & \text{present value} \\ \text{projected} & & \text{under} & & \text{of employee's} \\ \text{benefits} & & \text{LPCM} & & \text{career salary} \\ \text{at entry} & & & & \text{at entry age} \\ \text{age} & & & & \end{array}$$

The normal cost for the entire pension plan can be found by summing up the normal costs for all employees. Figure 2.1, which is based on simulations performed by Winklevoss and McGill [1979], shows the behavior of normal costs computed under different cost methods for a pension plan based on plan continuation assumptions specified by the authors. The benefits earned by the employees as well as the assumptions used in the simulations are the same under all methods.

Figure 2.1 indicates that it is possible for a company to switch from a cost-allocation to a benefit-allocation method for computing normal costs and achieve a reduction in the cost if the switch occurs when the average age of the plan is less than approximately fifteen years. Examination of switches of this type is the primary concern of this study. The effects of such switches on asset targets are also examined to identify some other factors motivating them.

2.2 Asset Target

The asset target is equal to the sum of (1) the actuarial values of benefits allocated to date to all employees and (2) the actuarial values of benefits payable to retirees. While the asset target for employees depends upon the actuarial cost method used, the asset target of retirees is the same under all methods. Asset targets have also been called actuarial liabilities or accrued



APBM = Accumulated-plan-benefit method (unit credit).
LPBM = Level-percentage-benefit method (modified unit credit).
LDBM = Level-dollar-benefit method (modified unit credit).
LPCM = Level-percentage-cost method (entry age normal).
LDCM = Level-dollar-cost method (entry age normal).

Figure 2.1 Normal Cost as a Percentage of Payroll under Various Funding Methods for Hypothetical Plan during 50-Year period. Source: Winklevoss and McGill [1979].

liabilities. However, it is not a liability in an accounting or contractual sense, but simply indicates a target assets must reach if they are funded according to a certain actuarial cost method.

Under the APBM, the asset target for employees is computed in the same fashion as normal cost except for factor (1) which is replaced by accumulated plan benefits, i.e.,

AT =	Total benefits allocated to date	x	Probability of surviving in employment to retirement	x	Discount factor from retirement to current age	x	Life annuity factor for $1 per year starting at retirement
	(1)		(2)		(3)		(4)

The asset target for the plan under APBM is at all times equal to the actuarial present value of all benefits credited today. The APBM is the only actuarial cost method that provides such an equality.

For the LDBM and the LPCM, factor (1) in the previous formula has to be replaced by

$$\text{Total benefits allocated to date under LDBM} = \text{Projected annual benefit at retirement} \times \frac{\text{Years of service to date}}{\text{Career years}}$$

$$\text{Total benefits allocated to date under LDBM} = \text{Projected annual benefit at retirement} \times \frac{\text{Salary paid to date}}{\text{Career salary}}$$

The asset target for cost-allocation methods can be computed by following either a prospective or a retrospective approach. Under the former approach normal cost can be computed from the following relationship:

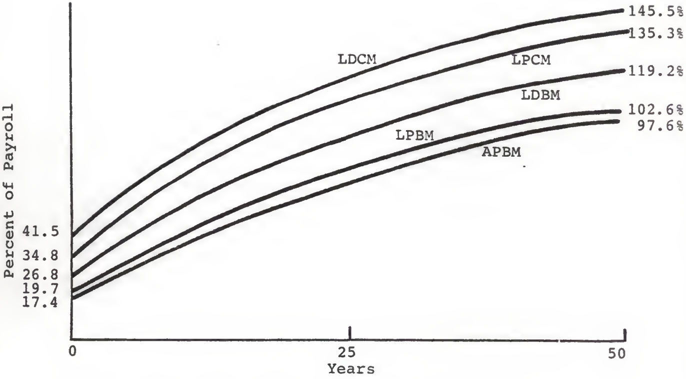
$$\begin{array}{lclcl} \text{Actuarial value} & & \text{Actuarial} & & \text{Actuarial} \\ \text{of normal costs} & = & \text{present} & - & \text{present value} \\ \text{allocated to date} & & \text{value of} & & \text{of future} \\ \text{(asset target)} & & \text{projected} & & \text{normal costs} \\ & & \text{benefits} & & \end{array}$$

The retrospective approach determines the asset target as the normal costs that should have been paid for each employee since his entry in the pension plan.

The relative behaviors of asset targets are shown in Figure 2.2. This figure is obtained from simulations performed by Winklevoss and McGill [1979]. The benefit-allocation methods show the lowest asset targets, while the cost-allocation methods show the highest asset targets.

The asset target under LDCM is consistently larger than the asset target under APBM, even from the inception of the plan; normal costs prior to the inception of the plan are larger under LDCM than under APBM. Thus, LDCM will provide more assets than required for the satisfaction of the present value of future benefits which corresponds to the asset target under APBM.

It is a common practice that if plan provisions, assumptions, or actuarial cost methods are changed, the actuary must determine a new schedule of normal costs from



LDCM = Asset target under level-dollar-cost method.
LPCM = Asset target under level-percentage-cost method.
LDBM = Asset target under level-dollar-benefit method.
LPBM = Asset target under level-percentage-benefit method.
APBM = Asset target under accumulated-plan-benefit method.

Figure 2.2 Asset Target for Hypothetical Plan under Various Funding Methods. Source: Winklevoss and McGill [1979].

the employee's entry. Accumulation of these new normal costs will give the current year's asset target. Hence, a switch from a cost-allocation to a benefit-allocation method will decrease the unfunded portion of asset target and may even show funds in excess of the target. This is another important benefit of switching from cost-allocation methods to benefit-allocation methods.

An unfunded asset target can arise from granting benefits for services performed prior to the establishment of the plan, plan amendments, and experience losses. If the actual experience of the plan is lower than that expected under the original assumptions, then an experience loss results. The unfunded asset target has been called unfunded liability, or unfunded past service liability, or unfunded actuarial liability. Under current accounting principles and funding regulations the unfunded asset target must be amortized over a period of years.

1.3 Supplemental Cost

The supplemental cost of a pension plan is a dollar amount that provides for the amortization of the unfunded asset target over a predetermined period. The most common approaches for determining supplemental costs are (1) Interest-Only Supplemental Cost, (2) Level-Dollar Supplemental Cost (LDSC), (3) Level-Percentage Supplemental Cost (LPSC), and (4) Rolling-Level-Dollar (or Rolling-Level-

Percentage) Supplemental Cost that is usually used with cost-allocation actuarial methods.

In the case of rolling supplemental costs, the actuary assumes that there will be no future employees entering the plan. If the level-dollar-cost method is used, a level amount of supplemental cost is determined for each employee such that the unfunded asset target will be zero by the time the last employee retires. In applying this procedure, the actuary determines the unfunded asset target every year, then computes a new level-dollar supplemental cost; hence, the name Rolling-Level-Dollar Supplemental Cost (RLDSC). Similarly, if the level-percentage cost method is used, a level percentage of supplemental cost is computed for each employee such that the unfunded asset target will be zero when the last employee retires. Again, the actuary computes the level percentage supplemental cost every year after determining the unfunded asset target; hence, the name Rolling-Level-Percentage Supplemental Cost (RLPSC).

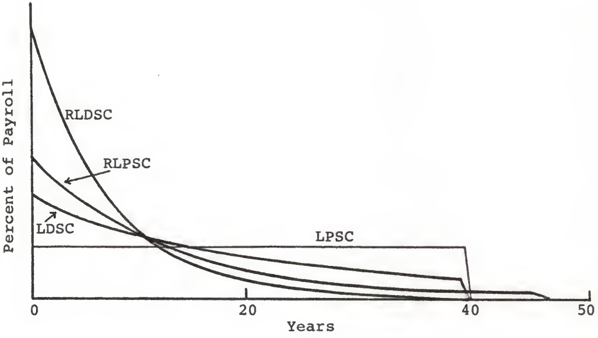
A rolling supplemental cost can be computed only after determining the initial unfunded asset target, i.e., the rolling supplemental cost can be based on the amounts of unfunded asset targets for every year except the unfunded target at the establishment of the plan. This is known as the frozen initial liability version of the entry-age normal. When the rolling cost method is based on all amounts of unfunded asset targets we have the aggregate method or projected benefit method without supplemental liability.

Results of the simulations performed by Winklevoss and McGill [1979] (Figure 2.3) show that a switch from an RLDSC or RLPSC to either LDSC or LPSC will cause a decrease in supplemental cost if it occurs in the first 15 years of a plan. This figure also shows that the method, and not the period, is the most important determinant of supplemental cost.

2.4 Factors Affecting Initial Selection of Cost-Allocation Methods

After the examination of the characteristics of the different actuarial cost methods, the following question needs to be addressed: "Why do companies initially select a particular cost-allocation method?" Several reasons may be offered for this selection.

Benefit security and smoothing of pension costs have been the two most important considerations affecting the initial selection of actuarial cost methods (Winklevoss [1976], Winklevoss and McGill [1979], and McGill [1981], Tepper [1981]). In general, cost-allocation methods can help management smooth earnings more than benefit-allocation methods. Specifically, the LPCM provides a normal cost which is a level percentage of payroll as Figure 2.1 shows. Furthermore, the long-term normal cost is lower under a cost-allocation method than under a benefit-allocation method.



LPSC = Level-percentage supplemental cost.
LDSC = Level-dollar supplemental cost.
RLPSC = Rolling-level-percentage supplemental cost.
RLDSC = Rolling-level-dollar supplemental cost.

Figure 2.3 Supplemental Cost as a Percentage of Payroll under Different Amortization Methods.

Cost-allocation methods may also be selected because they have an asset target in excess of the present value of future benefits. Actually, this characteristic of cost-allocation methods has contributed to their wide promotion by the actuarial profession which is interested in the security of pensioners' benefits.

Initial selection of a cost-allocation method may also reflect management style and economic conditions. Optimistic management will think that the future of the company is always going to be profitable, and they may adopt a cost-allocation method since the company will be able to afford the higher initial normal costs. Moreover, if economic conditions are favorable and the company has high earnings, there is a greater chance that a cost-allocation method will be adopted. This choice will allow the company to pay less taxes during the earlier years of the pension plan. In general, the selection of actuarial cost methods is a financial management decision with long-term implications and as such it will be considered to a greater extent in the following chapters.

CHAPTER III
REVIEW OF RELEVANT LITERATURE

The Financial Accounting Standards Board has considered three central issues in the project on employers' accounting for pensions. These issues are concerned with (1) the periods over which the pension costs should be recognized, (2) the choice of the appropriate actuarial cost method, and (3) whether unfunded pension liabilities should be reported in the balance sheet.

The first section of this chapter examines research relevant to the third issue of the employers' accounting for pensions project. The second issue is the primary concern of this study. Since most firms use the same actuarial cost method for accounting and funding purposes, changes in actuarial cost methods affect the amount of financial resources available to the firm. Hence, the second section of this chapter examines theories relevant to the choice of internal versus external sources of financing. The last section of this chapter examines empirical research on accounting method choice. In this section, research related to the first issue of the pensions project will also be examined.

3.1 Pension Funding (Unfunded Liability) Literature

Two primary models with extremely different implications have been developed to explain pension funding.

These are the tax-arbitrage model (Black [1980], and Tepper [1981]), and the pension-put model (Sharpe [1976]).

In the tax-arbitrage model, firm value maximization can be accomplished by maximizing the value of the pension tax shield, i.e., the amount of tax-free earnings on plan assets. The implications of the model have been derived for both a Miller [1977] capital market equilibrium and a non-Miller equilibrium. If a Miller [1977] equilibrium is assumed, bonds earn a higher pre-tax rate of return than stocks. Hence, a firm's tax advantage arises from holding bonds in the pension plan and earning higher pre-tax rates. If, on the other hand, a non-Miller equilibrium is assumed, there is a tax advantage to debt financing. Increased plan funding increases the amount of debt a firm can issue as well as the tax-deductible interest payments. In both worlds, the tax-arbitrage model implicitly assumes an augmented balance sheet, an approach consistent with the exposure draft on employers' accounting for pensions.

The pension-put model, on the other hand, is based on the assumption of perfect and complete markets. In the absence of taxes, Sharpe [1976] demonstrated that the firm's value is independent of the pension funding policy and of the value of the pension put. In the presence of the PBGC, however, an optimal funding policy for a firm is to maximize the value of the pension put. This can be achieved by increasing unfunded pension liabilities beyond thirty percent of the market value of the firm and investing pension funds in risky assets.

An overall investment and funding strategy of a firm would involve either funding as much as possible and holding only bonds for Black-Tepper reasons, or funding as little as possible and holding only risky stocks for Sharpe reasons. Indeed, Harrison and Sharpe [1983] have shown the optimality of such a strategy in a multiperiod context.

Empirical research testing for the determinants of pension funding has found some evidence along the lines of the theoretical model suggested by Sharpe [1976]. The most important finding is that firms facing nontrivial probability of bankruptcy have an incentive to underfund their pension plans. Specifically, Friedman [1982] presents evidence that firms fund their pension liabilities less than one-for-one at the margin. Moreover, according to Friedman, funding of the firm's pension liabilities relates negatively to its other liabilities, but it is not affected by certain measures of firm's risk, e.g., variability of earnings. Risk measures, however, were significant determinants of pension funding for high risk firms in Bodie et al. [1984]. In addition, Bodie et al. found that the tax status is an important determinant of pension funding for firms with above average tax liabilities. This last finding is consistent with the implications of the tax-arbitrage model.

Friedman [1982] and Bodie et al. [1984] also attempted to identify determinants of pension asset allocation between bonds and stocks. The only consistent finding is that riskier firms hold more bonds than stock in the pension plan. This finding is inconsistent with the implication of the pension-put model, but it is consistent with some type of "risk-offsetting" between firm risk and pension fund risk. Moreover, there was no strong evidence supporting the implications of the tax-arbitrage model with regard to pension plan investment decisions.

The implication of the previous line of research for accounting policy makers is that disclosure of pension plan asset composition provides important information about risk diversification activities in a firm. The more important accounting issue, however, is whether unfunded pension liabilities should be reported in the balance sheet. Empirical studies (Feldstein and Seligman [1981], Feldstein and Mørck [1983], and Daley [1984]) have addressed the last issue by examining whether pension liabilities are incorporated by the market in the determination of firm value. These studies have implicitly adopted the assumptions of the tax-arbitrage model.

The common characteristic of the studies examining the importance of pension liabilities in determining firm value is the use of cross-sectional valuation models. Feldstein and Seligman by relying on Tobin and Brainard's [1977] work use in essence a version of the Litzenberger and Rao [1971] equity valuation model. This model is a modification of the single period capital asset pricing model (CAPM) of Sharpe [1964] and Lintner [1965] that expresses market value of equity as a function of expected earnings, their standard deviation, and their growth. Feldstein and Seligman added another term to the Litzenberger and Rao valuation model, unfunded vested benefits.

The addition of more terms to this version of the CAPM may be consistent with mispecification of the model and/or the existence of measurement errors in the independent variables of the CAPM. If the CAPM is incorrect another valuation model must be used. But, if the independent variables are measured with error, the use of instrumental variables that are highly correlated with the explanatory variables becomes a necessity. Daley [1984] adopted such an instrumental variables approach.

Daley's theoretical and empirical work also included an adjustment of pension liabilities for the tax deductibility of pension costs. Feldstein and Seligman mentioned the necessity for such an adjustment but they did not consider it in the estimation process of their model. Overstatements of pension liabilities, along with measurement errors in the explanatory variables of the CAPM, can be sources of bias affecting the estimates of the regression coefficients.

The variety of interest rates used for the estimation of pension liabilities may also introduce measurement errors biasing the coefficients of the extended valuation models. Feldstein and Mørck tried to overcome that problem by adjusting pension liabilities to a common interest rate. They found that unfunded liabilities still reduced market values, but to a lesser extent. Daley introduced interest rates in the form of indicator variables in his valuation model and found that they are not important determinants of firm value. Daley's interest rates, though, were obtained from different sources, and different interest rates may have been used for different purposes. This has been empirically shown in Addy [1985].

The common finding of Feldstein and Seligman, as well as Feldstein and Mørck, is that market values appear to have incorporated an estimate of unfunded pension liabilities. Their results, however, are stronger when they use historical cost information and accrued pension liabilities instead of inflation adjusted information and vested benefits. Daley's findings agree with the previous line of research, but he also found that market values had impounded more consistently an estimate of pension costs than an estimate of unfunded vested benefits.

This line of empirical research based on the valuation model indicates that investors may not be fixated on balance sheet liabilities, but they also consider off-balance sheet items--an argument consistent with efficient markets. The implications of this empirical evidence, though, may have been ignored by the FASB. The FASB considers the balance sheet as the only place for disclosing liabilities even if compensating fictitious assets have to be introduced.

3.2 Theories of Financial Economics: Sources of Financing

The second primary issue addressed in the FASB project employers' accounting for pensions is choice of the appropriate actuarial cost method. This study examines one aspect of that problem: reasons motivating firms to switch from a cost-allocation to a benefit-allocation actuarial method. The effect of such a switch is to decrease pension expense and to increase net income. Moreover, the switch decreases the amounts actually funded for firms that use the same actuarial cost method for both accounting and funding purposes. Thus, the switch from a cost-allocation to a benefit-allocation method provides switching firms the opportunity of otherwise using internally generated funds instead of contributing them to the pension fund.

In this study, it is posited that the switch generated funds are used either to exploit growth opportunities or to improve the liquidity position of the firm. Hence, the question that arises is "why don't companies choose other sources of financing?" This question will be addressed within the context of theories from financial economics that examine factors affecting capital structure.

Modigliani and Miller [1963] showed that the firm value is independent of its capital structure except for the value added by the present value of tax savings arising from the deductibility of interest on debt. Increases in outstanding debt increase the value of the firm by the capitalized amount of the new debt multiplied by the corporate tax rate.

Scott [1976, 1977] demonstrated that a firm following an optimal debt to equity policy should issue as much secured debt as possible. His conclusions are based on the premise that all firms expect certain damages and have certain unsecured liabilities. Hence, the issuance of secured debt increases firm value by reducing the probability that unsecured claims will be paid in the event of bankruptcy. This is the only theory, however, demonstrating that benefits can arise from debt even in the absence of taxes.

Miller [1977] describes an equilibrium in a world where debt interest income is taxed at a higher rate than capital gains income derived from stocks. This equilibrium is for the aggregate supply and demand of corporate debt, and personal income taxes paid by bondholders just offset the corporate tax savings arising from the deductibility of interest on debt. Thus, a firm should be indifferent to the level of outstanding debt, and there is no optimal level of debt for an individual firm.

Miller's theory works if all firms face approximately the same marginal tax rate. However, in the presence of corporate tax shield substitutes for debt such as depreciation or investment tax credits, firms can face different marginal tax rates. The introduction of such features from the U.S. tax code led DeAngelo and Masulis

[1980] to a market equilibrium in which each firm has a unique optimum leverage decision due solely to the interaction between personal and corporate tax treatment for debt and equity.

Also, in the theory suggested by Miller [1977], personal income taxes on interest payments would offset the corporate interest tax shield if the firm pays the full statutory tax rate. As a result, a firm that pays a lower rate would observe a net loss to corporate borrowing. In contrast, under the Modigliani and Miller [1963] theory, a tax-paying firm would observe gains to borrowing. Indeed, the greater the marginal tax rate, the greater the gains. Modigliani and Miller [1963], though, do not explain why tax savings generated by debt do not lead firms in the real world to borrow as much as possible. The uncertainty of future tax savings is one reason cited by Modigliani [1981]. Tax savings are considered to be as risky as the underlying earnings stream, rather than a certain perpetuity as assumed in Modigliani and Miller [1963]. Bankruptcy costs may be another reason.

Having ignored bankruptcy costs, Modigliani and Miller [1963] led other researchers to speculate on their effects. Robichek and Myers [1966] argued that the expected costs of involuntary bankruptcy and reorganization have an adverse impact on the value of levered firms. These costs can be direct, such as legal and administrative expenses, as well as indirect, such as managerial time and effort devoted to the bankruptcy process and resulting operating inefficiencies. Moreover, as the probability of incurring these costs increases, the value of the firm decreases.

The questioning of the significance of bankruptcy costs (Miller [1977]) led to the introduction of two other types of such costs that arise from the agency relationship between bondholders and stockholders. Jensen and Meckling [1976] pointed out that there is an incentive for shareholders to transfer wealth from bondholders by undertaking risky projects. This behavior may cause lower future earnings and decline in the market value of the firm. Myers [1977] also argued that the risky debt of firms in financial distress may induce shareholders to reject positive net present value opportunities expiring before debt maturity. This will happen if the required amount for the investment is greater than the value of the firm minus the value of debt.

Expecting these two types of suboptimal investment decisions, bondholders will be induced to reduce the price of bonds at the moment of their issuance. Hence, shareholders have incentives to avoid suboptimal decisions from the point of view of the bondholders because these decisions imply reductions in firm value. Bonding and monitoring activities, however, can deter suboptimal decisions, but they are costly.

In general, an optimal amount of debt would involve a trade-off between agency costs, unavoidable firm value reductions arising from suboptimal decisions, and bankruptcy costs, on the one hand, and tax benefits arising from the deductibility of interest on debt, on the other (Chen and Kim [1979]).

The costs of internal and external sources of financing have also been considered by the "pecking order" theory in a more integrated way (Myers [1984] and Myers and Majluf [1984]). The primary assumptions of the "pecking order" theory are (1) management acts in the interest of existing stockholders, (2) stockholders are passive, and (3) management has information about projects that investors do not have, i.e., there is an asymmetry of information. The major implication of the theory is that firms will prefer internal over external sources for financing investment outlays. In general, external financing involves administrative and underwriting costs and sometimes underpricing of securities. Furthermore, asymmetric information creates another type of cost: the cost of passing up positive net present value projects because the firm does not find it beneficial to issue underpriced securities. Firms can avoid the last type of cost by maintaining a financial slack in the form of liquid assets and/or capability to issue safe debt.

According to Myers [1984] and Myers and Majluf [1984], firms will prefer issuance of debt over equity securities if they have to resort to external sources of financing. This is, however, a theoretical proposition based on the option pricing model, and empirical research would be necessary for its verification. Myers [1984] also argues that although most firms cover part of their investment outlays by borrowing, they try to restrain themselves and keep the debt safe. In this way, firms avoid the costs of financial distress and maintain their capability to issue more safe debt if it is necessary. Consequently, the "pecking order" theory specifies that firms will first use internally generated funds, then borrowed funds, and finally external equity to finance their investment outlays.

3.3 Empirical Research in Accounting Method Choice

Recent empirical studies addressing the issue of choice between accounting methods have relied extensively upon the agency theory developed by Jensen and Meckling [1976]. An important part of the theory is centered around the conflict of interests between bondholders and stockholders-managers. This conflict is controlled by contracts restricting the actions of management. Contractual restrictions usually require maintenance of a minimum amount of working capital and set a limit on leverage. The measurements typically specified in the contracts are computed under generally accepted accounting principles. Given that generally accepted accounting principles allow some freedom of choice among accounting alternatives, management may have incentive to select accounting methods relaxing contractual constraints. The incentive arises if the choice of a new accounting method allows stockholders-managers to expropriate bondholders.

Contractual agreements between stockholders and bondholders involve some costs, e.g., contracting and monitoring costs. Accounting method choice research assumes costly contracting and renegotiation. Hence, bondholders will seek renegotiation of old contracts if the marginal benefits of renegotiating exceed the marginal costs to them.

Studies examining accounting method choice have hypothesized that firms facing higher contracting and monitoring costs will choose accounting methods that increase reported income and tangible assets. The significance leverage, a proxy for contracting and monitoring costs, has been interpreted variously as an indication that highly levered firms prefer to capitalize interest (Bowen, Noreen, and Lacey [1981]), to use the straight line method of depreciation (Dhaliwal, Salamon, and Smith [1982]), to use full costing for oil and gas accounting (Dhaliwal [1980]), to adopt oil and gas accounting intramethod procedures that increase net income (Lilien and Pastena [1982]), to capitalize R and D (Daley and Vigeland [1983]), and to choose overall accounting method strategies that increase income (Zmijewski and Hagerman [1981]).

Another conflict described by agency theory is that between stockholders and management. Management can expropriate stockholders by consuming increasing amounts of perquisites as its share of ownership falls. Contracting agreements have been used to tie management interests to those of the shareholders. These agreements express management bonus as a function of earnings. Hence, management may have incentives to select income increasing accounting methods if these methods have a positive impact upon their wealth. The effect of such accounting choices may be mitigated by renegotiation of the compensation agreement. However, costly renegotiation has been assumed in studies examining the effect of management compensation plans on accounting method choice. Moreover, a world where managers are not penalized for increasing their wealth at the expense of shareholders has been assumed.

Empirical evidence (Zmijewski and Hagerman [1981]) shows that firms with management compensation agreements tied to accounting numbers choose income increasing strategies, but the reverse is not necessarily true. Abdel-khalik [1985] found that the switch to LIFO did not adversely affect income based bonuses. Thus, costless renegotiation of management compensation may be a plausible alternative.

Hagerman and Zmijewski [1979] attempted to identify economic reasons motivating the choice of the periods for amortizing pension past service costs. This issue represents an aspect of the broader issue determination of the periods over which pension costs must be amortized. As it was shown in Section 2.3, the method, not the periods of amortizing past service cost, is the relevant variable. This information, however, is not publicly available. Hagerman and Zmijewski found that management compensation plans induce the choice of longer periods for amortizing past service costs. Their findings were tainted by the insignificance of the overall probit model.

Political visibility has also been suggested as a factor affecting the choice of accounting methods. Managers of certain firms may have incentives to choose accounting methods that affect a firm's political visibility. In this way, managers may be attempting to deprive politicians of "excuses" for imposing restrictions on a firm's behavior. The link, though, between political visibility and accounting methods is more tenuous because it is based on implicit considerations rather than explicit contracts.

Several studies (Hagerman and Zmijewski [1979], Zmijewski and Hagerman [1981], Lilien and Pastena [1982], and Daley and Vigeland [1983]) have used size as a surrogate for political visibility. The significance of size shows that large firms prefer income decreasing accounting methods.

Most of the studies reviewed in this section have examined accounting method choices that do not have any direct cash flow implications. The switch of actuarial cost methods, though, has cash flow implications. As a result, the identification of possible reasons motivating the switch of actuarial cost methods will not be restricted to the suggestions of the agency theory.

CHAPTER IV
HYPOTHESIZED REASONS FOR THE SWITCH OF ACTUARIAL COST METHODS

The factors that may have motivated the switch of actuarial cost methods are identified by relying on previous accounting method choice research and the "pecking order" theory. In essence, this study presents "pecking order" theory and agency theory as complementary explanations for making certain changes in actuarial cost methods. Agency theory has been used to explain choices of "cosmetic" accounting methods. The switch of actuarial cost methods, though, involves real resources; that is why the "pecking-order" theory is also invoked. First, two general hypotheses are posited--one derived from "pecking order" theory (Hg1) and another derived from agency theory (Hg2). Subsequently, a number of specific operational hypotheses are drawn from each general hypothesis: Hs1 through Hs3 come from Hg1, while Hs4 and Hs5 come from Hg2.

4.1 Hypotheses Consistent with the "Pecking-Order" Theory

Hg1: Actuarial cost method switch firms needed to increase internally available funds in comparison with other firms.

The switch of actuarial cost methods increases the amount of internally available funds. These funds are usually less costly because internal financing does not involve administrative and underwriting costs as well as possible underpricing of securities. Moreover, internally available funds help a firm avoid the opportunity cost of passing up positive net present value projects even if the firm does not find it beneficial to issue underpriced securities. Hence, switch firms are expected to be in great need of least costly funds that can be used to build up an appropriate level of financial slack in the firm. The switch of actuarial cost methods helps firms accomplish that goal and as such is consistent with the "pecking order" theory. Eventually, the released funds from the switch can be used to improve liquidity and/or to finance positive net present value projects that will change the pace of firm growth. As a result, the following two operational hypotheses can be drawn from Hg1.

Hs1: Actuarial cost method switch firms needed to improve their liquidity position in comparison with that of other firms.

Hs2: Actuarial cost method switch firms needed to improve their expansion rate in comparison with that of other firms.

Occasionally, firms draw down their liquid assets to finance expansion, or build up liquid assets to undertake potential investment opportunities. Such a behavior suggests the possibility of an interaction between expansion and liquidity which is operationalized in the following hypothesis.

Hs3: The interaction between expansion and liquidity is significant.

The switch of actuarial cost methods may have been facilitated by the presence of pension assets in excess of the present value of pension benefits; a condition that will also be tested. Such a position in the pension plan occurs if funding takes place according to a cost-allocation method, while the present value of pension benefits is computed under the accumulated plan benefit method (APBM) per FASB Statement No. 36. The high earnings performance of pension plan investments can also contribute to the accumulation of pension assets in excess of pension liabilities. Consequently, firm management with a need for more funds to improve liquidity and/or expansion, observing excessive assets in the pension plan, decides to switch actuarial cost methods and slow funding down. Such a decision may have been encouraged by the costliness of recapturing any amounts that have already been funded in the pension plan.

4.2 Hypotheses Consistent with Agency Theory

Hg2: Actuarial cost method switch firms do not experience higher agency costs in comparison with other firms.

Lending agreements are one source of agency costs. These agreements, which are known as debt covenants, typically impose leverage restrictions upon a firm. The switch of actuarial cost methods increases the amount of assets available to a firm and as such contributes to a decrease in leverage and avoidance of certain agency costs. Specifically, the agency costs of debt covenant renegotiation, technical default, and issuance of new debt securities, as well as the costs of foregone investment opportunities are bypassed by switching actuarial cost methods and loosening leverage restrictions. Thus, the switch of actuarial cost methods is in the best interest of both bondholders and stockholders but is at the expense of labor whose security of collecting promised pension benefits decreases.

Management compensation (bonus) plans tied to earnings performance are another source of agency costs. These contracts provide management an incentive to switch to an income increasing actuarial cost method. Such a decision would also be encouraged if the earnings performance of switch firms was lower than that of nonswitch firms in the year preceding the switch. Hence, the managers of firms who probably did not collect a high bonus in a given year have a higher incentive to switch actuarial cost methods and improve earnings as well as bonus in the following year. Thus, a portion of the released funds from the switch is used for the payment of a higher bonus, while the remaining amount is used by the firm. As a result, the switch of actuarial cost methods benefits both the firm and its management at the expense of labor. In conclusion, the discussion of this section leads to the following two operational hypotheses, drawn directly from the general hypothesis Hg2.

Hs4: Actuarial cost method switch firms needed to improve their debt capacity in comparison with other firms.[1]

Hs5: Actuarial cost method switch firms needed to improve their earnings performance in comparison with other firms.

The low political visibility of switch firms may have facilitated the switch of actuarial cost methods; a condition that will also be tested. Small firms are usually less politically visible, i.e., less likely condidates for control of their actions by politicians. Thus, switch firms are expected to be smaller than nonswitch firms. As a result, the management of switch firms does not substantially increase the probability of any restrictions being imposed upon the firm's behavior by switching to an asset increasing actuarial cost method.

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[1] The improvement of the debt capacity is also consistent with the "pecking order" theory because switch firms try to maintain a financial slack in the form of higher borrowing capability.

CHAPTER V
METHODOLOGY

This chapter starts with a detailed description of the experimental design adopted in this study. The advantages of the design and the sampling procedure used in identifying switch and nonswitch firms are explicated. Finally, the concepts of the previous chapter are operationalized by using financial accounting indicators.

5.1 Experimental Design

The hypotheses stated in the previous chapter involve comparisons between switch and other firms. Two samples of other firms that did not change the actuarial cost methods are selected for comparison with the switch firms. In the first sample, nonswitch firms come from the same industry as switch firms and use the same actuarial cost method as switch firms prior to the switch. The second sample consists of randomly selected nonswitch firms. The purpose of this comparison procedure is to randomize away the effects of any variables other than the hypothesized ones.

The purpose of pair-matching is to control for the effects of the specific variables used in matching. In this study, matching is accomplished on the basis of industry classification, and use of the same actuarial cost method up to the time of the switch. Firms from the same industry usually promise comparable amounts of pension benefits to remain competitive in labor markets. Moreover, these firms probably use the same mortality and turnover assumptions. However, interest rates used for the computation of pension liabilities may be different. As a result, the interest rate is treated as a control variable that may be different between the two groups of firms, but it is not the primary concern of this study.

The hypotheses mentioned in the previous chapter will be tested by using both univariate and multivariate procedures. In a multivariate analysis, misleading inferences about individual coefficients may be drawn if the independent variables are highly correlated. On the other hand, a multivariate statistical technique may provide better explanatory power than a univariate one. Univariate tests[1] can also be misleading if the variables tested act as surrogates for other variables.

The univariate tests are used on both cross-sectional and time series bases. The time series basis involves comparisons of financial ratios of the year of the switch to the year prior to and the year after the switch for each group of firms. The cross-sectional tests are performed in the year prior to the switch, the year of the switch, and the year after the switch. The year of the switch has already incorporated the effects of the switch.

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[1] The univariate tests used are the t-test and the Wilcoxon matched-pairs sign-ranks test. The latter test is used only in the case of the matched-pairs. The t-test is a very robust parametric test based on the assumptions of normality and independence and the requirement of interval measurement scale. The Wilcoxon matched-pairs signed-ranks test, on the other hand, is a distribution-free test which is as powerful as the t-test with large sample sizes.

The hypothesis pertaining to the interaction between liquidity and expansion is tested by using only multivariate procedures. All the other hypotheses will be tested by both univariate and multivariate procedures.

Multivariate cross-sectional comparisons for each year are performed by using logistic analysis. Discriminant analysis can also be used with dichotomous dependent variables. If the independent variables are multivariate normally distributed, the discriminant analysis estimator is the true maximum likelihood estimator which in this case would be more efficient than the logit maximum likelihood estimator. But, if the independent variables are not multivariate normally distributed, the discriminant estimator is not even consistent, while the logit estimator is consistent and more robust.

Logit analysis also has an advantage especially relevant to this study where disproportionate sampling of the two populations occurs. Maddala [1983] shows that with disproportionate sampling only the constant term of the logit model changes, while all the logit coefficients are correct. Specifically, the constant term of a logit model based on disproportionate sampling increases by $\log p_1 - \log p_2$, where p_1 is the probability that an observation from the first population will be selected, and p_2 is the probability that an observation from the second population, which is sampled 100%, will be selected. The effect of disproportionate sampling, however, on the discriminant function or on probit model coefficients is not as simple as for the logit model coefficients.

Reasons motivating the switch of actuarial cost methods are inferred by observing the magnitude of the estimated coefficients of the logit models in the year prior to the switch, the year of the switch, and the year after the switch. McFadden [1976] performs similar comparisons for different (conditional) logit models.

The full logit model, as well as expectations for the signs of the coefficients are shown in Table 5.1. The explanatory power of the model is evaluated on the basis of the percentage of correctly classified firms. The predictive ability of the theory is estimated by following a jackknife approach. With this approach, one observation is left out, and the logit model is estimated on the remaining observations. The estimated model is subsequently used to classify the observation that was held out. This procedure is repeated until predictions for all observations are developed.

5.2 The Sample

Firms switching from the cost-allocation to the benefit-allocation actuarial cost method were identified

Table 5.1
The Multivariate Logit Model

Hypotheses	Hs1	Hs2	Hs3	Facilitating Condition	Hs4	Hs5	Facilitating Condition	Control
Expected[a] sign	-	-	?	+	+	-	-	?

Actuarial cost method choice (1 or 0) $= b_0 + b_1LY + b_2EX + b_3(LY)(EX) + b_4PPP + b_5DC + b_6EP + b_7PV + b_8IR$

1: Switch
0: Nonswitch
EX: Expansion
LY: Liquidity
PPP: Pension Plan Position
DC: Debt Capacity
EP: Earnings Performance
PV: Political Visibility
IR: Interest Rate

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[a] Expectations pertain to the year of the switch and the prior year. The coefficients for the year after the switch as well as the coefficient of EP for the switch year are expected to be insignificant; hence, their signs are not relevant.

from pension footnote information included in the annual reports. The annual reports of all the New York Stock Exchange firms were examined for the years from 1980 up to 1983. Moreover, the annual reports of the firms included in Accounting Trends and Techniques were examined for the same period. This population includes some firms that are traded on the American Stock Exchange and Over-the-Counter.

The identified switch firms had to report a decrease in pension expense as a result of the switch and to fund as they accrue pension costs. Moreover, only switches of firms for single employer defined benefit plan(s) are examined. In the case of single-employer plans, the employer determines the actuarial cost method, and negotiations evolve around pension benefits. On the other hand, in the case of multiemployer plans, labor unions have some influence upon the choice of the appropriate actuarial cost method.

Availability of financial information in the Compustat industrial file was another constraint for including switch firms in the study. Thus, the final sample consisted of forty-five switch firms. The number of switch firms per calendar year is given in Table 5.2, while descriptive statistics for the whole sample are presented in Table A.1. Sampling was restricted to the years 1980-1983 because firms started reported information about pension assets and accumulated benefits in 1980 when FASB Statement No. 36

Table 5.2
The Distribution of Firms by Calendar Year

Calendar Year	Number of Switch Firms
1980	3
1981	6
1982	16
1983	20
	45

was implemented. Firms switching methods in 1984 are not included due to the current unavailability of required financial information.

Nonswitch firms for the matched-pairs design use the same actuarial cost method as switch firms prior to the switch. These firms were also identified from the pension footnote information in the annual reports. Moreover, nonswitch firms were selected from the same industry as switch firms on the basis of four digits of the standard industry classification code. If such a matching was impossible, then only three digits were used. This was the case for four firms. Financial information availability was also a necessary condition for including nonswitch firms in the analysis. Descriptive statistics about this group of firms are provided in Table B.1.

The random sample of nonswitch firms was selected from the Compustat industrial file. This sample also has forty-five firms. Descriptive statistics for this sample of firms are shown in Table A.2.

5.3 Measurement of the Variables

The different concepts and variables identified in the hypotheses of Chapter IV are operationalized as follows:

Expansion:

$$EX_1 = \frac{PPE_t + RD_t + ADV_t - PPE_{t-1} - RD_{t-1} - ADV_{t-1}}{PPE_{t-1} + RD_{t-1} + ADV_{t-1}}$$

or

$$EX_2 = \frac{CAPEX_t + ACQ_t + ADV_t + RD_t}{PPE_{t-1}}$$

PPE_t: Property plant and equipment (net) at the end of year t,

RD_t: Research and development expense in year t,

ADV_t: Advertising expense in year t,

$CAPEX_t$: Capital expenditure in year t, and

ACQ_t: Acquisitions in year t.

Advertising and research and development costs are entered in the formulations for expansion because previous research (Long and Malitz [1983]) found that they are financed mostly with internally generated funds.

Liquidity: $LY_1 = \frac{CA_t}{CL_t}$

or

$$LY_2 = \frac{C_t + AR_t + STI_t}{CL_t}$$

CA_t: Current assets at the end of year t,

CL_t: Current liabilities at the end of year t,

C_t: Cash at the end of year t,

AR_t: Accounts receivable at the end of year t, and

STI_t: Short-term investments at the end of year t.

The first measure of liquidity (LY_1) is known as the current or working capital ratio. Contractual obligations, bond covenants, may require a minimum level of working capital. The second measure of liquidity (LY_2) is known as the quick ratio, and is a more sensitive measure of the liquidity slack that a company maintains.

Debt Capacity: $$DC_1 = \frac{LTD_t + PS_t}{TA_t - IA_t}$$

or

$$DC_2 = \frac{LTD_t + PS_t}{MVE_t}$$

LTD_t: Long-term debt at the end of year t,

PS_t: Preferred stock at the end of year t,

TA_t: Total assets at the end of year t,

IA_t: Intangible assets at end of year t, and

MVE_t: Market value of equity at the end of year t.

Pension Plan Position: $$PPP = \frac{PA_t}{PL_t}$$

PA_t: Pension assets at the end of year t,

PL_t: Pension liabilities, or total accumulated plan benefits at the end of year t.

Earnings Performance: $$EP_1 = \frac{EPS_t - EPS_{t-1}}{AEPS_{t-1}}$$

or

$$EP_2 = \frac{EPS_t - EPS_{t-1}}{AAEPS}$$

EPS_t: Earnings per share for year t,

$AEPS_{t-1}$: Absolute value of EPS_{t-1}, and

AAEPS: Absolute value of the average EPS from the six years prior to year t.

Absolute values were initially introduced because there were firms with negative EPS_{t-1}. Averages were computed in an attempt to avoid negative denominators. However, there were still a few negative averages, and absolute values of the averages were used.

Political Visibility: $LTA = \ln (TA_t)$

TA_t: Total assets at the end of year t.

CHAPTER VI
EMPIRICAL RESULTS

This chapter presents empirical results of the multivariate tests based on switch and randomly selected nonswitch firms. The univariate time series and cross-sectional tests for switch and random nonswitch firms are in Appendix A. Appendix B provides the univariate (time series and cross-sectional) as well as the multivariate tests for switch firms and their industry matched counterparts.

6.1 Multivariate Models for Switch and Randomly Selected Nonswitch Firms

Tables 6.1 through 6.4 present multivariate logit models estimated for the switch and randomly selected nonswitch firms. These tables include models for the year prior to the switch, the year of the switch, and the year after. For each year, the full model is followed by a reduced version. The reduced model includes only the significant variables and the individual components of the liquidity-expansion interaction if the interaction is significant.

There are some similarities between certain tables as far as ways of measuring variables are concerned. In Tables 6.1 and 6.2, all variables are measured the same way except expansion. In Table 6.1, the first measure of expansion

Table 6.1
Logit Models for Switch and Randomly Selected Nonswitch Firms[d]

	b_0 +	b_1LY_2 +	b_2EX_1 +	$b_3LY_2{*}EX_1$ +	b_4PPP +	b_5DC_1 +	b_6EP_2 +	b_7LTA +	b_8IR	% Correctly Classified	Model Chi-Square
Expected sign[e]		-	-	?	+	+	-	-	?		
Year - 1	-6.7 $(2.7)^a$	-0.32 (0.79)	-9.48 $(4.82)^b$	9.81 $(4.46)^b$	1.69 $(0.66)^a$	1.59 (2.46)	-1.10 $(0.51)^b$	0.04 (0.19)	0.54 $(0.22)^a$	72.2	29.06^a
	-5.8 $(2.1)^a$	-0.48 (0.74)	-9.03 $(4.67)^b$	9.39 $(4.31)^b$	1.71 $(0.67)^a$	--	-1.13 $(0.50)^b$	--	0.54 $(0.22)^a$	76.7	29.17^a
Switch Year	-5.2 $(2.46)^b$	-1.08 (0.78)	-25.02 $(9.13)^a$	22.27 $(7.82)^a$	1.93 $(0.60)^a$	1.88 (2.44)	0.38 (0.47)	0.06 (0.19)	0.39 $(0.18)^b$	74.4	32.37^a
	-4.35 $(1.75)^a$	-1.20 $(0.71)^c$	-25.01 $(8.83)^a$	22.14 $(7.51)^a$	1.89 $(0.58)^a$	--	--	--	0.39 $(0.18)^b$	71.1	31.15^a
Year + 1	-3.81 (2.70)	-0.03 (0.48)	1.22 (5.46)	4.14 (5.61)	1.24 $(0.77)^c$	3.00 (3.40)	-0.55 (0.65)	0.007 (0.27)	0.172 (0.20)	71.2	13.18^c

[a] Significant at the 0.01 level.

[b] Significant at the 0.05 level.

[c] Significant at the 0.1 level.

[d] Numbers within parentheses indicate standard errors.

[e] The coefficients for the year after the switch as well as the coefficient of EP for the year of the switch are expected to be insignificant; hence, their signs are not relevant.

Table 6.2
Logit Models for Switch and Randomly Selected Nonswitch Firms[d]

	b_0 +	b_1LY_2 +	b_2EX_2 +	$b_3LY_2{*}EX_2$ +	b_4PPP +	b_5DC_1 +	b_6EP_2 +	b_7LTA +	b_8IR	% Correctly Classified	Model Chi-Square
Expected sign[e]		-	-	?	+	+	-	-	?		
Year - 1	-5.21 (2.72)^b	-0.10 (1.21)	-2.86 (2.72)	1.72 (2.41)	1.51 (0.61)^a	0.49 (2.38)	-1.05 (0.50)^b	0.01 (0.19)	0.46 (0.20)^b	72.2	25.11^a
	-4.89 (2.20)^b	-0.16 (1.17)	-2.91 (2.68)	1.72 (2.38)	1.52 (0.61)^a	--	-1.06 (0.49)^b	--	0.46 (0.20)^b	74.4	25.05^a
Switch Year	-4.23 (2.59)^b	-0.39 (0.99)	-3.07 (2.57)	2.28 (2.00)	1.20 (0.48)^a	1.76 (2.35)	0.53 (0.44)	0.01 (0.18)	0.35 (0.16)^b	67.8	19.96^a
	-3.58 (1.82)^b	-0.56 (0.86)	-3.27 (2.39)	2.52 (1.93)	1.18 (0.48)^a	--	--	--	0.34 (0.16)^b	74.4	17.97^a
Year + 1	-6.03 (3.21)^c	0.85 (1.08)	2.57 (2.74)	-1.44 (1.97)	1.33 (0.79)^c	4.32 (3.81)	-0.63 (0.56)	0.12 (0.24)	0.14 (0.19)	71.2	7.82

[a] Significant at the 0.01 level.

[b] Significant at the 0.05 level.

[c] Significant at the 0.1 level.

[d] Numbers within parentheses indicate standard errors.

[e] The coefficients for the year after the switch as well as the coefficient of EP for the year of the switch are expected to be insignificant; hence, their signs are not relevant.

Table 6.3
Logit Models for Switch and Randomly Selected Nonswitch Firms[d]

	b_0 +	b_1LY_1 +	b_2EX_1 +	$b_3LY_1{*}EX_1$ +	b_4PPP +	b_5DC_1 +	b_6EP_2 +	b_7LTA +	b_8IR	% Correctly Classified	Model Chi-Square
Expected sign[e]		-	-	?	+	+	-	-	?		
Year - 1	-7.85 $(3.06)^a$	0.04 (0.45)	-8.82 $(4.82)^c$	4.94 $(2.37)^b$	1.82 $(0.69)^a$	2.40 (2.43)	-1.21 $(0.52)^a$	0.084 (0.21)	0.56 $(0.22)^a$	71.1	28.41^a
	-6.44 $(2.23)^a$	-0.07 (0.41)	-7.47 $(4.53)^c$	4.25 $(2.21)^b$	1.77 $(0.68)^a$	--	-1.23 $(0.51)^a$	--	0.55 $(0.21)^a$	74.4	27.26^a
Switch Year	-5.46 $(2.62)^b$	-0.49 (0.47)	-19.04 $(7.05)^a$	8.94 $(3.18)^a$	1.43 $(0.52)^a$	2.69 (2.35)	0.54 (0.47)	0.027 (0.20)	0.48 $(0.19)^a$	72:2	29.35^a
	-4.67 $(1.87)^a$	-0.52 (0.42)	-18.32 $(6.78)^a$	8.59 $(3.01)^a$	1.40 $(0.52)^a$	--	--	--	0.48 $(0.20)^a$	72.2	26.95^a
Year + 1	-4.05 (3.03)	0.01 (0.36)	3.34 (7.25)	1.00 (3.80)	1.23 (0.77)	3.32 (3.36)	-0.68 (0.64)	0.01 (0.28)	0.18 (0.19)	67.3	12.66

[a] Significant at the 0.01 level.

[b] Significant at the 0.05 level.

[c] Significant at the 0.1 level.

[d] Numbers within parentheses indicate standard errors.

[e] The coefficients for the year after the switch as well as the coefficient of EP for the year of the switch are expected to be insignificant; hence, their signs are not relevant.

Table 6.4
Logit Models for Switch and Randomly Selected Nonswitch Firms[d]

Expected sign[e]	-	-	?	+	+	-	-	?		
	b_0	+ b_1LY_1	+ b_2EX_2	+ $b_3LY_1{*}EX_2$	+ b_4PPP	+ b_5DC_1	+ b_6EP_2	+ b_7LTA	+ b_8IR	% Correctly Classified	Model Chi-Square
Year - 1	-6.10 (3.0)^b	0.21 (0.69	-2.36 (2.71)	0.60 (1.20)	1.64 (0.64)^a	0.40 (2.28)	-1.11 (0.50)^b	0.06 (0.20)	0.45 (0.20)^b	70.0	24.77^a
	-5.38 (2.33)^b	0.13 (0.64)	-2.44 (2.62)	0.62 (1.14)	1.63 (0.64)^a	--	-1.11 (0.49)^b	--	0.46 (0.19)^b	71.1	24.62^a
Switch Year	-3.80 (2.71)	-0.52 (0.65)	-5.30 (3.37)	2.20 (1.45)	1.16 (0.49)^a	1.53 (2.23)	0.58 (0.45)	0.05 (0.20)	0.37 (0.17)^b	68.9	20.63^a
	-3.02 (1.94)	-0.57 (0.58)	-5.06 (3.03)^c	2.14 (1.33)^c	1.14 (0.49)^b	--	--	--	0.35 (0.17)^b	74.4	18.58^a
Year + 1	-5.55 (4.00)	0.28 (0.87)	1.77 (3.56)	-0.45 (1.63)	1.32 (0.86)	3.56 (3.90)	-0.64 (0.58)	0.10 (0.26)	0.17 (0.18)	67.3	7.31

[a] Significant at the 0.01 level.

[b] Significant at the 0.05 level.

[c] Significant at the 0.1 level.

[d] Numbers within parentheses indicate standard errors.

[e] The coefficients for the year after the switch as well as the coefficient of EP for the year of the switch are expected to be insignificant; hence, their signs are not relevant.

(EX_1) is used, while in Table 6.2 the other measure of expansion (EX_2) is used. This is also true for Tables 6.3 and 6.4. The last pair of tables, though, uses LY_1 as a measure for liquidity, while Tables 6.1 and 6.2 use LY_2. Moreover, empirical evidence is provided only for one measure of debt capacity (DC_1) and one measure of earnings performance (EP_2) since the other measures (DC_2, EP_1) provided similar results.

A chi-square test is used to evaluate overall model significance. All models in the year of the switch and the prior year are significant at the 0.01 level of significance. On the contrary, only one out of four models is significant in the year following the switch. However, this could also be partially attributed to the smaller sample that was available for the development of the models in the year after the switch; fifty observations for the year after versus ninety for the switch year.

The next section presents empirical results consistent with "pecking order" theory. Subsequently, evidence consistent with agency theory is discussed. Then, the incremental explanatory power of one theory over the other is examined. Finally, the explanatory and predictive abilities of the models are evaluated.

6.2 Empirical Results Consistent with "Pecking Order" Theory

This section presents empirical results for the variables that are associated with the "pecking order" theory, i.e., liquidity, expansion, the interaction between liquidity and expansion, as well as pension plan position. The empirical results are discussed for one variable at a time starting with liquidity and proceeding to the right of the tables. Liquidity, in general, is not significantly different between the two groups of firms. Only in Table 6.1 is the switch of actuarial cost methods associated with low liquidity at the 0.1 level of significance.

The evidence from Tables 6.1 and 6.3 reveals that in the year prior to the switch the lower the expansion (EX_1) the higher the probability of switching actuarial cost methods. This association becomes even stronger in the year of the switch. The increasing weight for EX_1, which is significant at the 0.01 level of significance, provides the relevant evidence. The other measure of expansion (EX_2) is significant only in one model at the 0.1 level. Table 6.4 shows that there is a negative association between the switch of actuarial cost methods and expansion (EX_2) in the year of the switch.

The interaction between expansion and liquidity is statistically significant whenever expansion is significant, e.g., in Tables 6.1, 6.3, and 6.4. In general, this interaction is positively associated with the switch of actuarial cost methods. Moreover, the coefficient of the interaction increases from the year prior to the switch to the year of the switch, while its significance varies from 0.1 to 0.01 across different models.

An interpretation of the liquidity-expansion interaction is attempted by dividing each sample of switch and nonswitch firms into low liquidity and high liquidity subsamples on the basis of their median liquidity. The mean expansion for each subsample is then computed. Table 6.5 shows the mean expansion (top) and the mean liquidity (bottom) of each subsample involved in the interaction for the switch year model of Table 6.3. According to this figure, switch firms experience low expansion at low levels of liquidity and higher expansion at high levels of liquidity. Nonswitch firms, on the other hand, experience high expansion at low levels of liquidity and lower expension at high levels of liquidity. Thus, nonswitch firms appear to draw down liquid assets to finance expansion, while switch firms build up liquid assets commensurate with the size of their expansion. Similar conclusions can be drawn from the other significant interactions seen in Tables 6.1 and 6.4.

An explanation of the positive sign for the switch year liquidity-expansion interaction of Table 6.3 is shown in Table 6.6. Table 6.6 shows the marginal effect of expansion at three levels of liquidity, and the marginal effect of liquidity at three levels of expansion. The three levels are the highest value from the lowest decile, the mean, and the lowest value from the highest decile of either the expansion or the liquidity distribution. Table 6.6 reveals that an increase in liquidity increases the marginal effect

Table 6.5
Switch Year Mean Expansion (EX_1) and Mean Liquidity (LY_1) for Low and High Liquidity Switch and NonSwitch Firms[a]

	S	NS
High LY_1	0.135 2.664	0.025 2.756
Low LY_1	0.037 1.606	0.124 1.436

S: Switch firms
NS: Nonswitch firms

[a] The top number is mean EX_1 and the bottom number is mean LY_1 of each subsample of firms.

Table 6.6
Marginal Effect of Expansion and Liquidity

ME of $EX/LY_{.1} = -19.04 + 8.94\ (1.21) = -8.222^{a}$	st. error = 3.518
ME of $EX/\overline{LY} = -19.04 + 8.94\ (2.11) = -0.176$	st. error = 1.962
ME of $EX/LY_{.9} = -19.04 + 8.94\ (3.13) = 8.942^{a}$	st. error = 3.755
ME of $LY/EX_{.1} = -0.49 + 8.94\ (-0.069) = -1.106$	st. error = 0.617
ME of $LY/\overline{EX} = -0.49 + 8.94\ (0.085) = 0.269$	st. error = 0.409
ME of $LY/EX_{.9} = -0.49 + 8.94\ (0.33) = 2.460^{b}$	st. error = 0.91

$EX = EX_1$
$LY = LY_1$
ME = Marginal Effect

[a] Significant at the 0.1 level.

[b] Significant at the 0.05 level.

of expansion and an increase in expansion increases the marginal effect of liquidity; hence, the positive sign of the liquidity-expansion interaction.

Tables 6.1 through 6.4 reveal that the higher the pension plan position (PPP) in the year prior to the switch the higher the probability that firms will switch actuarial cost methods. This association is consistently significant at the 0.01 level of significance. The strength of this association also persist in the year of the switch as the significance of the relevant coefficient indicates. The pension plan position coefficient, though, is insignificant in the year after the switch, with Table 6.1 presenting the only exception.

The control variable, interest rate (IR), used for the computation of pension liabilities is also statistically significant at either 0.05 or 0.01 level of significance. The consistent positive association between interest rate and switch of actuarial cost methods indicates that switch firms appear to select higher interest rates. Higher interest rates decrease pension liabilities, improve the reported pension plan position, and facilitate the switch that decreases funding. The small correlation between PPP and IR in Table 6.7, though, indicates that each variable conveys distinctive information.

In general, Tables 6.1 through 6.4 indicate that switch firms needed to increase the amount of internally available funds. Specifically, switch firms needed to improve

Table 6.7
Correlation Matrix for Switch and Random Nonswitch Firms--Switch Year[a]

	LY_1	LY_2	EX_1	EX_2	LY_1*EX_1	LY_1*EX_2	LY_2*EX_1	LY_2*EX_2	PPP	DC_1	DC_2	EP_1	EP_2	LTA	IR
LY_1	1.00 0.00	0.69 0.01	0.005 0.95	0.28 0.01	0.14 0.17	0.57 0.01	0.15 0.13	0.53 0.01	-0.12 0.23	-0.21 0.03	-0.27 0.01	0.24 0.02	0.20 0.05	-0.48 0.01	-0.001 0.99
LY_2		1.00 0.00	-0.008 0.93	0.19 0.06	0.10 0.32	0.40 0.01	0.18 0.07	0.59 0.01	0.03 0.72	-0.36 0.01	-0.46 0.01	0.28 0.01	0.15 0.01	-0.33 0.01	-0.06 0.56
EX_1			1.00 0.00	0.65 0.01	0.97 0.01	0.55 0.01	0.94 0.01	0.50 0.01	0.007 0.94	-0.13 0.28	-0.23 0.02	0.19 0.06	0.17 0.09	-0.01 0.91	-0.39 0.01
EX_2				1.00 0.00	0.68 0.01	0.93 0.01	0.66 0.01	0.87 0.01	-0.00 0.99	-0.37 0.01	-0.42 0.01	0.36 0.01	0.33 0.01	-0.07 0.46	-0.19 0.06
LY_1*EX_1					1.00 0.00	0.63 0.01	0.97 0.01	0.59 0.01	-0.00 0.98	-0.17 0.10	-0.28 0.01	0.23 0.02	0.22 0.03	-0.05 0.59	-0.37 0.01
LY_1*EX_2						1.00 0.00	0.62 0.01	0.93 0.01	-0.00 0.98	-0.38 0.01	-0.44 0.01	0.40 0.01	0.37 0.01	-0.23 0.02	-0.15 0.13
LY_2*EX_1							1.00 0.00	0.63 0.01	-0.00 0.94	-0.15 0.13	-0.27 0.01	0.23 0.02	0.22 0.03	-0.09 0.36	-0.39 0.01
LY_2*EX_2								1.00 0.00	0.03 0.75	-0.43 0.01	-0.49 0.01	0.41 0.01	0.38 0.01	-0.22 0.03	-0.18 0.08
PPP									1.00 0.00	-0.12 0.25	-0.30 0.01	0.10 0.34	0.10 0.30	-0.04 0.67	0.10 0.33
DC_1										1.00 0.00	0.85 0.01	-0.28 0.01	-0.23 0.02	0.15 0.13	0.07 0.51
DC_2											1.00 0.00	-0.32 0.01	-0.26 0.01	-0.20 0.05	0.13 0.20
EP_1												1.00 0.00	0.96 0.01	-0.18 0.08	-0.02 0.83
EP_2													1.00 0.00	-0.19 0.06	-0.02 0.84
LTA														1.00 0.00	0.11 0.27
IR															1.00 0.00

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[a] Spearman correlation coefficient and significance level.

liquidity (as Table 6.1 indicates) and expansion (as Tables 6.1, 6.3, and 6.4 show). The higher pension plan position of switch firms (Tables 6.1 through 6.4) facilitated the switch of actuarial cost methods. Finally, the insignificance of the liquidity and expansion coefficients in the year after the switch, as well as the analysis of liquidity-expansion interaction for the year of the switch indicate some improvement in the amount of internally available funds.

6.3 Empirical Results Consistent With Agency Theory

This section discusses the empirical results for the variables of the multivariate models that are associated with the agency theory, i.e., debt capacity, earnings performance, and political visibility. Debt capacity (DC_1) as well as expected political visibility costs (LTA) are not significant in any of the models shown in Tables 6.1 through 6.4. Earnings performance (EP_2), on the other hand, is significant in the year prior to the switch as all four tables show. This significance implies that the lower the earnings performance in the year prior to the switch the higher the probability that firms will switch actuarial cost methods in the subsequent period. In that way, switch firms improve their earnings performance, and no subsequent association is observed between earnings performance and decision to switch actuarial cost methods since both groups of firms perform equally well.

In general, the empirical evidence from Tables 6.1 through 6.4 supports the hypothesis that switch firms are not adversely affected by higher agency costs in the year of the switch. Moreover, switch firms seem to satisfy their need of improving earnings in comparison with nonswitch firms. Hence, in the presence of bonus plans tied to earnings performance, management also benefits from the switch.

6.4 Incremental Explanatory Power of One Theory Over the Other

The incremental explanatory power of one theory over the other is investigated by developing a series of models which are shown in Table 6.8. The first model (M_1) includes PPP and IR. These two variables are not directly associated with any theory, but are more often significant than any other variables. The second model (M_2) includes the variables of M_1, as well as the three variables pertaining to agency theory, i.e., DC_1, EP_2, and LTA. A chi-square test is used to test whether the last three variables as a group are significant in M_2. This test is based on the difference between the log likelihoods of M_1 and M_2. A third model (M_3 includes the variables of M_1 and the "pecking-order" theory variables from Table 6.1, i.e., EX_1, LY_2, and EX_1*LY_2. A chi-square test on the difference between the log likelihoods of M_1 and M_3 shows whether the "pecking-order" theory variables as a group are significant

Table 6.8
Logit Models Testing[d] the Incremental Explanatory Power of One Theory Over the Other

	b_0	+ b_1LY_2	+ b_2EX_1	+ $b_3LY_2{*}EX_1$	+ b_4PPP	+ b_5DC_1	+ b_6EP_2	+ b_7LTA	+ b_8IR	% Correctly Classified	-2 log Like-lihood
Year - 1											
M_1:	-4.41^a	--	--	--	1.34^a	--	--	--	0.35^b	68.9	110.36
M_2:	-5.2^a	--	--	--	1.48^a	0.19	-1.18^a	-0.043	0.46^a	71.1	103.43
M_3:	-4.43	-0.65	-10.46^b	10.05^a	1.59^a	--	--	--	0.40^b	72.2	101.21
M_4:	-6.7^a	-0.32	-9.48^b	9.81^b	1.69^a	1.59	-1.10^b	0.04	0.54^a	72.2	95.11
Switch Year											
M_1:	-4.52^a	--	--	--	1.22^a	--	--	--	0.35^b	66.7	110.04
M_2:	-4.75^a	--	--	--	1.23^a	2.20	0.49	-0.035	0.36^b	70.0	107.84
M_3:	-4.35^a	-1.20^c	-25.01^a	22.14^a	1.89^a	--	--	--	0.39^b	71.1	93.61
M_4:	-5.27^b	-1.08	-25.02^a	22.27^a	1.93^a	1.88	0.38	0.06	0.39^b	74.4	92.39

[a] Significant at the 0.01 level.

[b] Significant at the 0.05 level.

[c] Significant at the 0.1 level.

[d] Year - 1: $M_1 \log L - M_2 \log L = 6.93^b$, $M_1 \log L - M_3 \log L = 9.15^b$, $M_2 \log L - M_4 \log L = 8.32^b$,

$M_3 \log L - M_4 \log L = 6.1^b$.

Switch Year: $M_1 \log L - M_2 \log L = 2.2$, $M_1 \log L - M_3 \log L = 16.43^a$, $M_2 \log L - M_4 \log L = 15.45^a$,

$M_3 \log L - M_4 \log L = 0.22$.

log L = -2 log Likelihood of a model.

in model M_3. The full model of Table 6.1 is the fourth model (M_4). The difference between the log likelihoods of M_3 and M_4 shows whether agency theory variables, as a group, are significant in a model that already includes PPP, IR, EX_1, LY_2, and EX_1*LY_2. Finally, a chi-square test on the difference between the log likelihoods of M_2 and M_4 shows the incremental explanatory power of "pecking-order" theory over agency theory and the two variables: PPP and IR. These tests are performed for the year prior to the switch and the year of the switch.

The tests for the year prior to the switch, based on the variables of Table 6.1, reveal that both theories are important in explaining the switch of actuarial cost methods. In the year of the switch, though, only the "pecking order" theory can explain the switch. Similar results are obtained from comparisons based on the variables of Table 6.3. Tests on variables of Tables 6.2 and 6.4 reveal that only agency theory can explain the switch in the prior year, while no theory is important in the year of the switch.

6.5 Explanatory and Predictive Powers of the Models

The explanatory power of the multivariate logit models is evaluated on the basis of the percentage of correctly classified firms. This percentage varies from 76.7% to 67.3% across models. Even insignificant models classify 67.3% of the firms correctly.

The predictive ability of the theory is evaluated by following a jackknife logit approach. The full model for the switch year from Table 6.1 is used as a basis for the predictions. According to that model, 64.4% of the observations were predicted correctly.

CHAPTER VII
SUMMARY AND CONCLUSIONS

This chapter presents a brief summary of the study and the inferences that can be drawn from the results. Certain limitations of the study and their effects are also examined. Finally, the contributions of this study and possible extensions to future research are discussed.

7.1 Summary and Conclusions

The goal of this study was to identify reasons that motivate the switch of actuarial cost methods in accounting for pensions. Specifically, this study attempted to identify reasons for switching from a cost-allocation to a benefit-allocation method that occurs in the earlier years of a pension plan. The effects of such a switch result in a decrease in pension expense, an increase in earnings per share and since switch firms fund an amount equal to pension expense, a decrease in the amount funded.

Reasons motivating the switch of actuarial cost methods were suggested by the "pecking-order" theory as well as agency theory. These reasons were tested in the context of both univariate and multivariate analyses, involving cross-sectional as well as time series approaches.

The general conclusions that can be drawn from the empirical results of the previous chapter, and its appendices, are discussed below. The discussion starts with conclusions pertaining to the "pecking order" theory and continues with conclusions associated with the agency theory. Finally, some conclusions of methodological nature are drawn.

The empirical results of the previous chapter appear to support the general hypothesis that actuarial cost method switch firms needed to increase the amount of internally available funds in comparison with other firms. The lower expansion rate of switch firms in the year prior to the switch and the year of the switch provides some relevant evidence. The lower liquidity of switch firms, especially when compared to their industry matched counterparts, provides additional evidence. It appears that switch firms have less liquid assets (but not necessarily less working capital) than nonswitch firms in the year of the switch. Some limited evidence for improved expansion and liquidity exists for the year following the switch. The incompleteness of the sample, though, does not allow any definitive conclusions.

An analysis of the liquidity-expansion interaction revealed that one group of switch firms had high liquidity at high levels of expansion. This building-up of liquid assets is consistent with the "pecking order" theory. But, another group of switch firms experienced low liquidity at low levels of expansion. This last group probably drives the finding from the multivariate models that all switch firms have lower liquidity and lower expansion. On the other hand, high liquidity nonswitch firms showed low expansion, while low liquidity nonswitch firms showed high expansion. This finding suggests that highly expanding nonswitch firms draw down their liquid assets to finance expansion, while highly expanding switch firms are capable of avoiding decreases in their liquid assets by switching actuarial methods. Finally, the low expansion low liquidity switch firms may be weak firms, while the low expansion high liquidity nonswitch firms are either building up their liquid assets or do not have any investment opportunities.

Pension plan position is an important condition facilitating or perhaps a necessary condition for the switch of actuarial cost methods. This conclusion is supported by both univariate and multivariate tests. In general, switch firms have a higher financial slack in the pension plan than nonswitch firms, i.e., switch firms have more assets for the satisfaction of their pension liabilities than nonswitch firms. Most of the empirical results, except the multivariate models based on switch and random nonswitch firms, indicate that this financial slack reaches its peak in the year of the switch. One, however, would expect that the peak would have been reached in the year prior to the switch and a decline would have been observed thereafter. Two explanations are provided for this finding.

The first explanation has to do with the timing of the actuarial valuations. An actuarial valuation estimates pension assets and liabilities as of the beginning of a fiscal year and has not yet incorporated the effects of the switch occurring during the year. Thus, a decline in the pension plan position will probably be observed in the following year. The second explanation may have to do with the high amount of assets that has already been accumulated in the pension plan. As a result, the total returns on the high amounts of assets are also so high as to offset any declines in the assets arising from reduced contribution. Furthermore, since the financial slack has been accumulated over a long time period, a decline in it may be observed only in the long-term. Thus, the two-year investigation period following the switch may not show any substantial declines in the pension plan financial slack.

The excessive financial slack in the pension plan could have been created by the higher interest rates of the switch firms. But, the low correlation between the two variables and the significance of the respective coefficients in the multivariate models indicate that each variable conveys distinctive information.

The empirical results of the previous chapter seem also to support the general hypothesis that actuarial cost method switch firms are not adversely affected by higher agency costs as a result of the switch. In the presence of management compensation plans tied to earnings, management can benefit from the switch of actuarial cost methods at the expense of labor. Thus, management intention to affect earnings seems to be an important reason motivating the switch of actuarial cost methods. The comparisons of switch with random nonswitch firms indicate that switch firms had lower earnings performance in the year preceding the switch, but improved their performance in the year of the switch.

The switch of actuarial cost methods increases the amount of a firm's assets and helps the firm improve its debt capacity. Hence, improvement of debt capacity and avoidance of potential agency costs arising from low debt capacity seem to be possible reasons motivating the switch. Indeed, the multivariate models based on matched pairs point out that switch firms have lower debt capacity than nonswitch firms. Thus, the switch of actuarial cost methods represents an attempt of switch firms to avoid certain agency costs. The multivariate models based on matched pairs also provide some limited evidence that switch firms are smaller in size than nonswitch firms. As a result, switch firms, being less politically visible, can increase earnings and total assets without increasing the probability of any restrictions being imposed upon the firms' behavior.

An important contribution of this study is of a methodological nature--that of extending the test period to several years to capture the reasons/effects related to the switch. Some of the reasons motivating the switch of actuarial cost methods existed in the prior period (e.g., expansion, earnings performance), but either culminate (in case of expansion), or disappear (in case of earnings performance) in the year of the switch. While other reasons appear only in the year of the switch (e.g., low debt capacity or liquidity). The extent to which these reasons will not exist in the following year could not be conclusively determined in this study. As a result, any studies that investigate switches in accounting methods and limit the investigation horizon to one year will probably not capture all the reasons motivating the switch.

Another contribution of this study is the use of more than one theory for identifying reasons that motivate the switch of actuarial cost methods. The commonly used agency theory would not have provided an adequate explanation for the switch because it is not a "cosmetic" accounting change. Both agency and "pecking order" theories, however, seem to be good supplementary theories explaining this change that has direct cash flow implications.

7.2 Limitations

One of the limitations of this study is associated with the sample. First, there is an incomplete sample for the year following the switch due to the current unavailability of financial information (in the Compustat data tape) for the year 1984. Second, the total sample size, forty-five pairs of firms, is probably small. This happens because many firms switching actuarial cost methods do not disclose the new and the old methods. Thus, the tests based on ninety firms may have some bias of an unknown nature due to the small sample size.

The inferences from the multivariate models are drawn only by observing changes in the magnitude of the relevant coefficients and their significance level. This method is employed in the absence of any easily computed tests that compare the coefficients of the different models. Hence, this factor may be limiting the strength of the conclusions drawn from the multivariate models.

This study examines only a number of reasons motivating the switch. Other omitted reasons may have contributed to the switch. Tax considerations or even efforts to avert hostile takeovers may have motivated the switch. Recently, firms try to avoid showing assets in excess of pension liabilities because such surpluses could be used by the acquiring firm to finance the takeover. Alternatively, new management and/or new actuaries may have suggested the switch as a short term way of improving the financial condition of a firm.

This study concentrates on a single accounting method change. Other methods and means are also available to management for improving the financial condition of a firm. Thus, the effects of the switch may be contaminated if other measures are contemporaneously undertaken by management. This study also does not investigate whether the switch affects one or more pension plans.

7.3 Suggestions for Future Research

A possible extension of this study is to investigate the effect of switching actuarial cost methods on stock returns. Moreover, a comparison between switch and nonswitch firms' stock returns would reveal the impact of the switch in a better way. This comparison, though, would have to abstract from the effects of other variables that were statistically different between the two groups of firms in this study. Such a study would probably involve cross-sectional regressions with stock returns as the dependent variable and the following independent variables: switch versus nonswitch, liquidity, expansion, pension plan position, earnings performance, debt capacity, and size. The effect of other omitted variables from this study, e.g., tax status and management compensation, on stock returns could also be examined. Indeed, an extension of this study could consider whether these two variables affected the decision of firms to switch actuarial cost methods.

Another possible extension of this study could be to identify the economic determinants of choosing cost-allocation versus benefit-allocation methods for funding purposes. In a related vein, the economic determinants of choosing different methods for accounting and funding purposes could also be examined if one could identify such firms.

A feasible study seems to be an examination of the lobbying behavior of parties affected by the new exposure draft on employer's accounting for pensions. The use of one actuarial cost method for accounting has encountered strong opposition by firms and actuaries. One part of this study could identify (by using multi-dimensional scaling) how the different parties group together. Another part of the same study could identify the economic determinants of favoring or opposing the use of one actuarial cost method for accounting purposes.

APPENDIX A
UNIVARIATE TESTS FOR SWITCH AND RANDOM NONSWITCH FIRMS

Initially, the univariate time series behavior for switch and random nonswitch firms is examined. Table A.1 presents time series tests for switch firms. First, the mean value of a ratio from the hear prior to the switch is subtracted from the mean value of the same ratio from the year of the switch. Subsequently, the mean value of a ratio from the year of the switch is subtracted from the mean value of the same ratio from the year after the switch. The latter comparisons are based on an incomplete sample because financial information is not yet available in the Compustat tape for the fiscal year 1984. Table A.2 presents similar tests for randomly selected nonswitch firms, while Table A.3 depicts the univariate cross-sectional tests.

A.1 Evidence Consistent With "Pecking Order" Theory

Tables A.1 and A.2 show that the pension plan position (PPP) of switch and random nonswitch firms improves from the year of the switch to the following year. In addition, Table A.3 reveals that the pension plan position of switch firms remains consistently higher than the pension plan position of nonswitch firms at either 0.01 or 0.1 level of

Table A.1
Univariate Time Series Tests for Switch Firms

	Year - 1		Switch Year		Year + 1
$LY_1 = CA_t/CL_t$					
Mean	2.181		2.147		2.231
Std. dev.	0.846		0.665		0.740
T-test		-0.398		-0.398	
Obs.	45		45		26
$LY_2 = (C_t+AR_t+STI_t)/CL_t$					
Mean	1.171		1.168		1.31
Std. dev.	0.661		0.461		0.60
T-test		-0.047		+1.154	
Obs.	45		45		26
$EX_1 = (PPE_t+ADV_t+RD_t-PPE_{t-1}-ADV_{t-1}-RD_{t-1})/(PPE_{t-1}+ADV_{t-1}+RD_{t-1})$					
Mean	0.118		0.087		0.081
Std. dev.	0.140		0.185		0.217
T-test		-1.195		-1.18	
Obs.	45		45		26
$EX_2 = (CAEX_t+ACQ_t+ADV_t+RD_t)/PPE_{t-1}$					
Mean	0.444		0.432		0.412
Std. dev.	0.294		0.382		0.286
T-test		-0.887		-0.983	
Obs.	45		45		26
$DC_1 = (LTD_t+PS_t)/(TA_t-ITA_t)$					
Mean	0.206		0.218		0.215
Std. dev.	0.114		0.115		0.103
T-test		1.113		-0.225	
Obs.	45		45		26
$DC_2 = (LTD_t+PS_t)/MVE_t$					
Mean	0.00065		0.00056		0.00050
Std. dev.	0.00091		0.00055		0.00059
T-test		-0.866		-0.629	
Obs.	45		45		26
$EP_1 = (EPS_t-EPS_{t-1})/ABS(EPS_{t-1})$					
Mean	-0.107		-0.193		-0.110
Std. dev.	0.563		0.542		0.64
T-test		-0.759		+0.879	
Obs.	45		45		26

Table A.1
continued

	Year - 1		Switch Year		Year + 1
$EP_2 = (EPS_t - EPS_{t-1})/AV_{t-6}$					
Mean	-0.120		-0.132		-0.190
Std. dev.	0.567		0.543		0.571
T-test		-0.098		+0.174	
Obs.	45		45		26
$PPP = PA_t/PL_t$					
Mean	1.453		1.55		1.449
Std. dev.	0.675		0.714		0.478
T-test		2.676[a]		-0.592	
Obs.	45		45		29
$LTA = \ln(TA_t)$					
Mean	6.249		6.308		6.517
Std. dev.	1.306		1.272		1.352
T-test		2.779[a]		+2.577[a]	
Obs.	45		45		26
IR = Pension Interest Rate					
Mean	8.103		8.408		8.467
Std. dev.	1.518		1.429		1.750
T-test		2.842[a]		+1.107	
Obs.	45		45		29

[a] Significant at the 0.01 level.

[b] Significant at the 0.05 level.

[c] Significant at the 0.1 level.

Table A.2
Univariate Time Series Tests for Random Nonswitch Firms

	Year - 1		Switch Year		Year + 1
$LY_1 = CA_t/CL_t$					
Mean	2.046		2.092		2.205
Std. dev.	0.818		0.834		1.249
T-test		0.78		+0.74	
Obs.	45		45		26
$LY_2 = (C_t+AR_t+STI_t)/CL_t$					
Mean	1.037		1.077		1.203
Std. dev.	0.489		0.496		0.962
T-test		0.88		+1.16	
Obs.	45		45		26
$EX_1 = (PPE_t+ADV_t+RD_t-PPE_{t-1}-ADV_{t-1}-RD_{t-1})/(PPE_{t-1}+ADV_{t-1}+RD_{t-1})$					
Mean	0.115		0.083		-0.040
Std. dev.	0.186		0.174		0.158
T-test		-1.050		-3.004^a	
Obs.	45		45		26
$EX_2 = (CAEX_t+ACQ_t+ADV_t+RD_t)/PPE_{t-1}$					
Mean	0.500		0.471		0.342
Std. dev.	0.308		0.410		0.242
T-test		-0.745		-2.431^b	
Obs.	45		45		26
$DC_1 = (LTD_t+PS_t)/(TA_t-ITA_t)$					
Mean	0.198		0.202		0.197
Std. dev.	0.119		0.121		0.098
T-test		0.560		-0.586	
Obs.	45		45		26
$DC_2 = (LTD_t+PS_t)/MVE_t$					
Mean	0.00059		0.00062		0.00057
Std. dev.	0.00069		0.00076		0.00062
T-test		0.579		-1.206	
Obs.	45		45		26
$EP_1 = (EPS_t-EPS_{t-1})/ABS(EPS_{t-1})$					
Mean	0.108		-0.189		0.019
Std. dev.	0.491		0.585		0.620
T-test		-2.323^b		$+2.18^b$	
Obs.	45		45		26

Table A.2
continued

	Year - 1		Switch Year		Year + 1
$EP_2 = (EPS_t - EPS_{t-1})/AV_{t-6}$					
Mean	0.081		-0.246		-0.00048
Std. dev.	0.486		0.593		0.58
T-test		-2.545[b]		+2.23[b]	
Obs.	45		45		26
$PPP = PA_t/PL_t$					
Mean	1.095		1.182		1.215
Std. dev.	0.409		0.464		0.442
T-test		2.838[a]		+2.66[a]	
Obs.	45		45		26
$LTA = \ln(TA_t)$					
Mean	6.346		6.404		6.439
Std. dev.	1.455		1.464		1.463
T-test		3.147[a]		+0.390	
Obs.	45		45		26
IR = Pension Interest Rate					
Mean	7.386		7.642		7.97
Std. dev.	1.295		1.608		1.742
T-test		2.266[b]		+1.574	
Obs.	45		45		26

[a] Significant at the 0.01 level.

[b] Significant at the 0.05 level.

Table A.3
Cross-Sectional Comparisons of Switch Firms With Random Nonswitch Firms

	Year - 1		Switch Year		Year + 1	
	SF	NSF	SF	NSF	SF	NSF
LY_1						
Mean	2.180	2.046	2.147	2.092	2.231	2.20
Median	2.09	1.96	2.10	1.90	2.06	1.93
Std. dev.	0.84	0.81	0.66	0.83	0.74	1.25
T-test	0.76		0.34		0.09	
Obs.	45	45	45	45	26	26
LY_2						
Mean	1.171	1.037	1.168	1.077	1.319	1.203
Median	1.06	0.87	1.13	0.96	1.13	1.01
Std. dev.	0.66	0.48	0.46	0.49	0.60	0.96
T-test	1.09		0.89		0.51	
Obs.	45	45	45	45	26	26
EX_1						
Mean	0.118	0.115	0.087	0.083	0.081	-0.040
Median	0.10	0.10	0.04	0.07	0.04	-0.01
Std. dev.	0.14	0.18	0.18	0.17	0.21	0.15
T-test	0.08		0.11		2.30^b	
Obs.	45	45	45	45	26	26
EX_2						
Mean	0.444	0.500	0.432	0.471	0.412	0.342
Median	0.33	0.43	0.28	0.35	0.27	0.28
Std. dev.	0.29	0.30	0.38	0.41	0.28	0.24
T-test	-0.91		-0.46		0.94	
Obs.	45	45	45	45	26	26
DC_1						
Mean	0.206	0.198	0.218	0.202	0.215	0.197
Median	0.21	0.20	0.21	0.20	0.22	0.21
Std. dev.	0.11	0.11	0.11	0.12	0.10	0.09
T-test	0.32		0.63		0.65	
Obs.	45	45	45	45	26	26
DC_2						
Mean	0.00065	0.00059	0.00056	0.00062	0.00050	0.00057
Median	0.00036	0.00038	0.00035	0.00032	0.00027	0.00038
Std. dev.	0.0009	0.0006	0.00055	0.00076	0.00059	0.00062
T-test	0.33		-0.44		-0.43	
Obs.	45	45	45	45	26	26

Table A.3
continued

	Year - 1		Switch Year		Year + 1	
	SF	NSF	SF	NSF	SF	NSF
EP$_1$						
Mean	-0.107	0.108	-0.193	-0.189	-0.110	0.019
Median	-0.13	0.08	-0.19	-0.17	-0.22	0.07
Std. dev.	0.56	0.49	0.54	0.58	0.64	0.62
T-test	-1.93[b]		-0.03		-0.73	
Obs.	45	45	45	45	26	26
EP$_2$						
Mean	-0.120	0.081	-0.132	-0.246	-0.190	-0.0005
Median	-0.14	0.04	-0.14	-0.16	-0.23	0.07
Std. dev.	0.56	0.48	0.54	0.59	0.57	0.58
T-test	-1.81[c]		0.95		-1.18	
Obs.	45	45	45	45	26	26
PPP						
Mean	1.453	1.095	1.554	1.182	1.449	1.215
Median	1.22	1.08	1.32	1.18	1.28	1.19
Std. dev.	0.67	0.40	0.71	0.46	0.47	0.44
T-test	3.04[a]		2.92[a]		1.88[c]	
Obs.	45	45	45	45	29	26
LTA						
Mean	6.249	6.340	6.308	6.404	6.517	6.439
Median	6.19	6.39	6.31	6.52	6.32	6.57
Std. dev.	1.30	1.45	1.27	1.46	1.35	1.46
T-test	-0.33		-0.33		0.20	
Obs.	45	45	45	45	26	26
IR						
Mean	8.103	7.386	8.408	7.642	8.467	7.973
Median	8.0	7.0	8.0	7.3	8.0	8.0
Std. dev.	1.51	1.29	1.42	1.60	1.75	1.74
T-test	2.40[b]		2.39[b]		1.04	
Obs.	45	45	45	45	29	26

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[a] Significant at the 0.01 level.

[b] Significant at the 0.05 level.

[c] Significant at the 0.1 level.

significance (although the difference diminishes somewhat). Such a relationship may have been caused by the higher interest rates (IR) chosen by switch firms. Switch firms have statistically higher interest rates than nonswitch firms in the first two years of Table A.3. Higher interest rates give lower pension liabilities and higher pension plan positions. The extent to which differences in pension plan position are not solely attributable to differences in interest rates will be revealed by the multivariate cross-sectional models. The higher pension plan position of switch firms, regardless of what caused it, facilitated the switch of actuarial cost methods that may have contributed to the improvement in expansion (EX_1)--Table A.3. Hence, there is some limited evidence consistent with the "pecking order" theory.

A.2 Evidence Consistent With Agency Theory

Table A.3 shows that debt capacity (DC_1 or DC_2) and expected political visibility costs (LTA) are not different between the two groups of firms over time. This occurs in spite of the increase over time in the size (LTA) of each group of firms, as Tables A.1 and A.2 reveal. Consequently, the evidence from Table A.3 indicates that the switch of actuarial cost methods did not contribute to any increases in agency costs. Moreover, the lower earnings performance (EP_1 or EP_2) of switch firms in the year prior to the switch may have motivated the switch of actuarial cost methods in the following year, so that management will collect a bonus at the expense of labor.

APPENDIX B
EMPIRICAL RESULTS BASED ON SWITCH AND INDUSTRY MATCHED NONSWITCH FIRMS

This appendix presents the empirical results of univariate and multivariate tests where the nonswitch sample of firms is industry matched. Table B.1 shows the time series behavior of the matched nonswitch firms. The time series behavior of switch firms was presented earlier in Table A.1. Table B.2 presents the univariate cross-sectional comparisons between the two groups of firms. The evidence from these two tables is consistent with that discussed in Appendix A except for earnings performance. The earnings performance of switch firms is equal to the earnings performance of nonswitch firms during the three years of the investigation period. This relationship, however, does not clearly reveal the need for an improvement in earnings performance.

Tables B.3 through B.6 present the multivariate logit models developed on the matched pairs of firms. These tables provide the same information as in Tables 6.1 through 6.4 and in certain aspects they are similar. In Tables B.3 and B.4, like in Tables 6.1 and 6.2, all variables are measured the same way except expansion. In Table B.3, the first measure of expansion (EX_1) is used, while in Table B.4 the second measure of expansion ($EX2$) is used. This

Table B.1
Univariate Time-Series Tests for Matched Nonswitch Firms

	Year - 1		Switch Year		Year + 1
$LY_1 = CA_t/CL_t$					
Mean	2.170		2.098		2.056
Std. dev.	0.741		0.684		0.784
T-test		-0.799		-0.783	
Obs.	45		45		26
$LY_2 = (C_t+AR_t+STI_t)/CL_t$					
Mean	1.170		1.198		1.200
Std. dev.	0.465		0.480		0.459
T-test		0.606		+0.688	
Obs.	45		45		26
$EX_1 = (PPE_t+ADV_t+RD_t-PPE_{t-1}-ADV_{t-1}-RD_{t-1})/(PPE_{t-1}+ADV_{t-1}+RD_{t-1})$					
Mean	0.151		0.113		0.107
Std. dev.	0.200		0.200		0.201
T-test		-1.552		-2.592[a]	
Obs.	45		45		26
$EX_2 = (CAEX_t+ACQ_t+ADV_t+RD_t)/PPE_{t-1}$					
Mean	0.469		0.436		0.527
Std. dev.	0.265		0.294		0.614
T-test		-1.369		-0.095	
Obs.	45		45		26
$DC_1 = (LTD_t+PS_t)/(TA_t-ITA_t)$					
Mean	0.196		0.198		0.214
Std. dev.	0.125		0.124		0.132
T-test		0.179		-0.796	
Obs.	45		45		26
$DC_2 = (LTD_t+PS_t)/MVE_t$					
Mean	0.00053		0.00052		0.00057
Std. dev.	0.00062		0.00074		0.00075
T-test		-0.143		+0.350	
Obs.	45		45		26
$EP_1 = (EPS_t-EPS_{t-1})/ABS(EPS_{t-1})$					
Mean	-0.120		-0.105		-0.024
Std. dev.	0.543		0.621		0.551
T-test		0.123		+0.018	
Obs.	45		45		26

Table B.1
continued

	Year - 1		Switch Year		Year + 1
$EP_2 = (EPS_t - EPS_{t-1})/AV_{t-6}$					
Mean	-0.149		-0.123		-0.052
Std. dev.	0.576		0.598		0.489
T-test		0.196		-0.026	
Obs.	45		45		26
$PPP = PA_t/PL_t$					
Mean	1.230		1.286		1.352
Std. dev.	0.476		0.430		0.430
T-test		2.10[b]		+1.825[c]	
Obs.	45		45		27
$LTA = \ln(TA_t)$					
Mean	6.392		6.496		6.632
Std. dev.	1.454		1.465		1.389
T-test		4.688[a]		+2.811[a]	
Obs.	45		45		26
IR = Pension Interest Rate					
Mean	7.540		7.688		7.785
Std. dev.	1.298		1.304		1.190
T-test		2.719[a]		+1.081	
Obs.	45		45		27

[a] Significant at the 0.01 level.

[b] Significant at the 0.05 level.

[c] Significant at the 0.1 level.

Table B.2
Cross-Sectional Comparisons of Matched Pairs

	Year - 1		Switch Year		Year + 1	
	SF	NSF	SF	NSF	SF	NSF
LY_1						
Mean	2.18	2.17	2.14	2.09	2.23	2.05
Median	2.09	2.20	2.10	2.15	2.06	2.02
Std. dev.	0.84	0.74	0.66	0.68	0.74	0.78
T-test	0.07		0.41		0.88	
Wilcoxon-test	-0.16		0.129		-0.61	
Obs.	45	45	45	45	26	26
LY_2						
Mean	1.17	1.17	1.16	1.19	1.31	1.20
Median	1.06	1.14	1.13	1.20	1.13	1.16
Std. dev.	0.66	0.46	0.46	0.48	0.60	0.45
T-test	0.006		-0.36		0.89	
Wilcoxon-test	-0.67		-0.37		0.39	
Obs.	45	45	45	45	26	26
EX_1						
Mean	0.11	0.15	0.08	0.11	0.07	0.08
Median	0.10	0.14	0.05	0.06	0.04	0.05
Std. dev.	0.14	0.20	0.18	0.20	0.21	0.13
T-test	-1.09		-0.70		-0.52	
Wilcoxon-test	-1.34		-0.68		-0.86	
Obs.	45	45	45	45	26	26
EX_2						
Mean	0.43	0.46	0.405	0.43	0.41	0.52
Median	0.33	0.44	0.28	0.35	0.27	0.30
Std. dev.	0.26	0.26	0.29	0.29	0.28	0.61
T-test	-1.071		-1.32		-1.048	
Wilcoxon-test	-1.049		-0.60		0.17	
Obs.	45	45	45	45	26	26
DC_1						
Mean	0.20	0.19	0.21	0.19	0.21	0.21
Median	0.21	0.18	0.21	0.18	0.22	0.20
Std. dev.	0.11	0.12	0.11	0.12	0.10	0.13
T-test	0.46		0.89		0.05	
Wilcoxon-test	0.52		0.96		0.24	
Obs.	45	45	45	45	26	26

Table B.2
continued

	Year - 1		Switch Year		Year + 1	
	SF	NSF	SF	NSF	SF	NSF
DC_2						
Mean	0.0006	0.0005	0.00056	0.00052	0.00050	0.00057
Median	0.00036	0.00034	0.00035	0.00027	0.00027	0.00028
Std. dev.	0.0009	0.0006	0.0005	0.0007	0.0005	0.0009
T-test	0.81		0.33		-0.91	
Wilcoxon-test	0.41		1.06		0.19	
Obs.	45	45	45	45	26	26
EP_1						
Mean	-0.10	-0.12	-0.19	-0.10	-0.11	-0.02
Median	-0.13	-0.025	-0.19	-0.12	-0.22	-0.07
Std. dev.	0.56	0.54	0.54	0.62	0.64	0.55
T-test	0.14		-1.17		-0.63	
Wilcoxon-test	0.05		-0.51		-0.71	
Obs.	45	45	45	45	26	26
EP_2						
Mean	-0.12	-0.15	-0.13	-0.12	-0.19	-0.05
Median	-0.14	-0.02	-0.15	-0.11	-0.23	-0.05
Std. dev.	0.56	0.57	0.54	0.59	0.57	0.48
T-test	0.30		-0.07		-1.10	
Wilcoxon-test	0.11		-0.07		-1.14	
Obs.	45	45	45	45		26
PPP						
Mean	1.45	1.23	1.55	1.29	1.45	1.35
Median	1.22	1.09	1.32	1.17	1.28	1.31
Std. dev.	0.67	0.47	0.71	0.43	0.48	0.43
T-test	1.92^c		2.33^a		0.50	
Wilcoxon-test	2.30^b		2.16^b		-0.59	
Obs.	45	45	45	45	29	27
LTA						
Mean	6.25	6.39	6.30	6.49	6.51	6.63
Median	6.19	6.74	6.31	6.69	6.32	7.12
Std. dev.	1.30	1.45	1.27	1.46	1.35	1.38
T-test	-0.60		-0.81		-0.42	
Wilcoxon-test	-0.37		-0.53		-0.15	
Obs.	45	45	45	45	26	26

Table B.2
continued

	Year - 1		Switch Year		Year + 1	
	SF	NSF	SF	NSF	SF	NSF
IR						
Mean	8.10	7.54	8.40	7.66	8.46	7.79
Median	8.0	7.50	8.00	7.10	8.00	7.50
Std. dev.	1.51	1.29	1.42	1.30	1.75	1.19
T-test	2.90[a]		2.04[b]		1.98[c]	
Wilcoxon-test	2.01[b]		2.79[a]		-1.30	
Obs.	45	45	45	45	29	27

[a] Significant at the 0.01 level.

[b] Significant at the 0.05 level.

[c] Significant at the 0.1 level.

Table B.3
Logit Models for Switch and Industry Matched Nonswitch Firms[d]

	b_0 +	b_1LY_2 +	b_2EX_1 +	$b_3LY_2{*}EX_1$ +	b_4PPP +	b_5DC_1 +	b_6EP_2 +	b_7LTA +	b_8IR	% Correctly Classified	Model Chi-Square
Expected sign[e]		-	-	?	+	+	-	-	?		
Year - 1	-2.12 (2.20)	-0.95 (0.75)	-8.52 (4.14)[b]	6.50 (3.58)[c]	0.64 (0.46)	2.03 (2.15)	-0.036 (0.41)	-0.096 (0.61)	0.33 (0.19)[c]	62.2	13.37[c]
	-1.91 (1.70)	-1.03 (0.73)	-8.15 (4.04)[b]	6.27 (3.49)[c]	0.62 (0.42)	--	--	--	0.300 (0.18)[c]	66.7	12.09[b]
Switch	-3.84 (2.16)[c]	-1.26 (0.69)[c]	-20.43 (7.50)[a]	15.87 (5.75)[a]	1.35 (0.53)[a]	2.01 (2.19)	-0.187 (0.45)	-0.22 (0.20)	0.56 (0.23)[a]	68.9	26.25[a]
	-4.18 (1.91)[b]	-1.33 (0.67)[b]	-21.9 (7.62)[a]	17.00 (5.83)[a]	1.42 (0.51)[a]	--	--	--	0.47 (0.20)[b]	67.8	24.38[a]
Year + 1	-2.70 (0.38)	0.42 (0.85)	4.96 (6.77)	-4.44 (6.01)	-0.09 (0.73)	-1.21 (3.08)	-0.44 (0.666)	-0.20 (0.27)	0.50 (0.28)[c]	62.0	6.03

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[a] Significant at the 0.01 level.

[b] Significant at the 0.05 level.

[c] Significant at the 0.1 level.

[d] Numbers within parentheses indicate standard errors.

[e] The coefficients for the year after the switch as well as the coefficient of EP for the year of the switch are expected to be insignificant; hence, their signs are not relevant.

Table B.4
Logit Models for Switch and Industry Matched Nonswitch Firms[d]

Expected sign[e]		-	-	?	+	+	-	-	?		
	b_0 +	b_1LY_2 +	b_2EX_2 +	$b_3LY_2{*}EX_2$ +	b_4PPP +	b_5DC_1 +	b_6EP_2 +	b_7LTA +	b_8IR	% Correctly Classified	Model Chi-Square
Year - 1	0.29 (2.52)	-2.12 (1.33)	-6.48 (3.69)^{c}	4.92 (3.10)	0.65 (0.46)	1.43 (2.09)	0.073 (0.409)	-0.16 (0.18)	0.29 (0.19)	66.7	12.37
	1.66 (1.52)	-2.04 (1.25)^{c}	-6.14 (3.50)^{c}	4.33 (2.88)	0.83 (0.45)^{c}	--	--	--	--	64.4	9.03^{c}
Switch Year	-1.63 (2.33)	-2.28 (1.07)^{b}	-8.01 (3.46)^{b}	6.11 (2.65)^{b}	1.19 (0.54)^{b}	2.67 (2.13)	-0.077 (0.44)	-0.32 (0.20)^{c}	0.54 (0.22)^{a}	67.8	21.73^{a}
	-0.84 (2.23)	-2.30 (1.05)^{b}	-7.88 (3.41)^{b}	5.85 (2.59)^{b}	1.12 (0.52)^{b}	--	--	-0.29 (0.19)	0.51 (0.21)^{a}	64.4	20.16^{a}
Year + 1	-1.88 (3.58)	0.03 (1.14)	-0.06 (2.26)	0.08 (1.65)	-0.004 (0.74)	-1.00 (3.31)	-0.004 (0.646)	-0.25 (0.28)	0.47 (0.28)^{c}	64.0	5.48

[a] Significant at the 0.01 level.

[b] Significant at the 0.05 level.

[c] Significant at the 0.1 level.

[d] Numbers within parentheses indicate standard errors.

[e] The coefficients for the year after the switch as well as the coefficient of EP for the year of the switch are expected to be insignificant; hence, their signs are not relevant.

Table B.5
Logit Models for Switch and Industry Matched Nonswitch Firms[d]

	b_0 +	b_1LY_1 +	b_2EX_1 +	$b_3LY_1{*}EX_1$ +	b_4PPP +	b_5DC_1 +	b_6EP_2 +	b_7LTA +	b_8IR	% Correctly Classified	Model Chi-Square
Expected sign[e]		-	-	?	+	+	-	-	?		
Year - 1	-2.49 (2.35)	-0.359 (0.44)	-7.51 (4.17)[c]	3.07 (2.00)	0.61 (0.45)	2.50 (2.08)	-0.04 (0.40)	-0.099 (0.19)	0.34 (0.19)[c]	61.1	11.57
	-3.14 (1.90)	-0.28 (0.41)	-7.57 (4.23)[c]	3.02 (2.028)	0.67 (0.42)	2.57 (2.08)	--	--	0.31 (0.18)[c]	60.0	11.31[c]
Switch Year	-5.65 (2.54)	-0.87 (0.54)	-33.76 (11.09)[a]	14.49 (4.74)[a]	1.522 (0.54)[a]	4.28 (2.37)[c]	0.02 (0.49)	-0.19 (0.21)	0.73 (0.25)[a]	72.2	34.85[a]
	-6.68 (2.30)[a]	-0.75 (0.51)	-35.0 (11.19)[a]	14.98 (4.78)[a]	1.62 (0.53)[a]	4.21 (2.38)[c]	--	--	0.66 (0.23)[a]	70.0	33.97[a]
Year + 1	-3.83 (3.61)	0.45 (0.58)	7.18 (8.62)	-3.29 (3.95)	0.12 (0.72)	-0.79 (3.03)	-0.27 (0.68)	-0.17 (0.28)	0.51 (0.29)	58.0	6.41

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[a] Significant at the 0.01 level.

[b] Significant at the 0.05 level.

[c] Significant at the 0.1 level.

[d] Numbers within parentheses indicate standard errors.

[e] The coefficients for the year after the switch as well as the coefficient of EP for the year of the switch are expected to be insignificant; hence, their signs are not relevant.

Table B.6
Logit Models for Switch and Industry Matched Nonswitch Firms[d]

	b_0 +	b_1LY_1 +	b_2EX_2 +	$b_3LY_1{*}EX_2$ +	b_4PPP +	b_5DC_1 +	b_6EP_2 +	b_7LTA +	b_8IR	% Correctly Classified	Model Chi-Square
Expected sign[e]		-	-	?	+	+	-	-	?		
Year - 1	-0.95 (2.68)	-0.64 (0.71)	-3.99 (2.90)	1.45 (1.25)	0.64 (0.46)	1.21 (1.96)	-0.018 (0.39)	-0.13 (0.19)	0.307 (0.19)	62.2	9.79
	-1.53 (2.13)	-0.51 (0.66)	-3.84 (2.87)	1.33 (1.22)	0.68 (0.43)	--	--	--	0.26 (0.17)	62.2	8.93
Switch Year	-1.30 (2.68)	-2.31 (0.84)[a]	-13.54 (4.52)[a]	6.04 (1.94)[a]	1.32 (0.57)[b]	4.23 (2.34)[c]	0.05 (0.48)	-0.35 (0.21)[c]	0.73 (0.25)[a]	72.2	29.94[a]
	-1.36 (2.61)	-2.29 (0.82)[a]	-13.46 (4.46)[a]	6.02 (1.93)[a]	1.32 (0.57)[b]	4.26 (2.32)[c]	--	-0.36 (0.21)[c]	0.73 (0.24)[a]	72.2	29.93[a]
Year + 1	-1.6 (4.77)	-0.09 (0.98)	-0.84 (2.55)	0.48 (1.17)	-0.03 (0.74)	-0.86 (3.33)	-0.35 (0.66)	-0.27 (0.32)	0.47 (0.28)[c]	66.0	5.82

[a] Significant at the 0.01 level.

[b] Significant at the 0.05 level.

[c] Significant at the 0.1 level.

[d] Numbers within parentheses indicate standard errors.

[e] The coefficients for the year after the switch as well as the coefficient of EP for the year of the switch are expected to be insignificant; hence, their signs are not relevant.

alternate use of expansion measures is also continued in Tables B.5 and B.6, which correspond to Tables 6.3 and 6.4, respectively. Moreover, Tables B.5 and B.6 use LY_1 to measure liquidity, as opposed to LY_2 which is used in Tables B.3 and B.4. Finally, all tables include only one measure of debt capacity (DC_1) and one measure of earnings performance (EP_2) because the other measures (DC_2, EP_1) yielded similar results.

A chi-square test for overall model significance indicates that all models for the switch year in Tables B.1 through B.4 are significant at the 0.01 level. These tables also have significant reduced form models in the year prior to the switch, except Table B.4. On the other hand, all models in the year following the switch are insignificant. The smaller sample size in the latter case, twenty-five matched pairs, may have contributed to the insignificance of these models.

Empirical evidence related to the logit models is presented in the following order. First, empirical results for the hypotheses associated with "pecking order" theory are discussed, starting with liquidity and proceeding to the right of the tables. Next, empirical results consistent with agency theory are presented. Subsequently, the incremental explanatory power of one theory over the other is discussed. Finally, information about the explanatory and predictive powers of the models is provided.

B.1 Empirical Results Consistent With "Pecking Order" Theory

The importance of liquidity as a factor motivating the switch of actuarial methods can be seen from Tables B.3, B.4, and B.6. The first measure of liquidity (LY_1) is significant only in Table B.6 during the switch year. The other measure of liquidity (LY_2) is significant in both the switch year, Tables B.3 and B.4, and the prior year, Table B.4. Thus, LY_2 is significant even in models for which LY_1 is not significant. The negative sign of the liquidity coefficients indicates that the lower the liquidity the higher the probability that firms will switch actuarial cost methods to avoid further decreases in liquid assets.

Expansion (either EX_1 or EX_2) is another significant variable both in the year of the switch and the prior year; only the model of Table B.6 for the prior year has an insignificant expansion coefficient. The sign of the expansion coefficient is always negative, indicative of the negative association between expansion and decision to switch. Thus, the lower the past or current expansion rate, the higher the probability that firms will switch actuarial cost methods. This relationship becomes stronger in the year of the switch when the weight assigned to expansion reaches its highest value and firms decide to switch actuarial cost methods.

The liquidity-expansion interaction is always statistically significant in the models of the switch year shown in Tables B.3 through B.6. In Table B.3, the interaction is also significant in the prior year at the 0.1 level. Moreover, the interaction is positively associated with the decision of a firm to switch actuarial cost methods.

An analysis of the liquidity-expansion interaction along the lines of Section 6.2 provides more information about the liquidity and expansion positions of the two groups of firms. Table B.7 shows the mean expansion (top) and the mean liquidity (bottom) of each subsample involved in the interaction for the switch year model of Table B.4. This behavior is similar to the behavior of the interaction analyzed in Section 6.2. The average switch firm, again, appears to build up liquid assets commensurate with the size of its expansion, while the average nonswitch firm draws down its liquid assets to finance the expansion. This conclusion can be extended to the other interactions from Tables B.3, B.5, and B.6.

Table B.8 provides an explanation for the positive sign of the switch year liquidity-expansion interaction from Table B.4. In Table B.8, an increasing liquidity increases the marginal effect of expansion, and an increasing expansion increases the marginal effect of liquidity; hence, the positive sign of the liquidity-expansion interaction.

Finally, the interest rate used for the computation of pension liabilities is always significant in the year of the switch, and in Tables B.3 and B.5, is also significant in

Table B.7
Switch Year Mean Expansion (EX_2) and Mean Liquidity (LY_2) for Low and High Liquidity Switch and Nonswitch Firms[a]

	S	NS
High LY_2	0.480 1.509	0.409 1.574
Low LY_2	0.330 0.828	0.463 0.804

S: Switch firms
NS: Nonswitch firms

[a] The top number is mean EY_2 and the bottom number is mean LY_2 of each subsample of firms.

Table B.8
Marginal Effect of Expansion and Liquidity

ME of $EX/LY_{.1} = -8.01 + 6.11\ (0.55) = -4.659^{a}$	st. error = 2.09
ME of $EX/\overline{LY} = -8.01 + 6.11\ (1.18) = -0.800$	st. error = 0.94
ME of $EX/LY_{.9} = -8.01 + 6.11\ (1.81) = 3.049$	st. error = 1.73
ME of $LY/EX_{.1} = -2.28 + 6.11\ (0.095) = -1.699$	st. error = 0.86
ME of $LY/\overline{EX} = -2.28 + 6.11\ (0.42) = 0.286$	st. error = 0.57
ME of $LY/EX_{.9} = -2.28 + 6.11\ (0.89) = 3.157^{a}$	st. error = 1.54

$EX = EX_2$
$LY = LY_2$
ME = Marginal Effect

[a] Significant at the 0.1 level.

the prior year. Thus, the significance of the interest rate coefficient points out the importance of controlling for the effects of that variable which can affect pension plan position. The absence, though, of any significant correlation between interest rate and pension plan position, as Table B.9 shows, indicates that each variable contains distinctive information.

In general, Tables B.3 through B.6 indicate that switch firms needed to increase the amount of internally available funds. Specifically, switch firms needed to improve liquidity (as Tables B.3, B.4, and B.6 show), and expansion (as Tables B.3 through B.6 show). The consistently higher pension plan position of switch firms seems to have facilitated the switch of actuarial cost methods (as Tables B.2 through B.6 indicate). Finally, an analysis of the significant positive liquidity-expansion interaction for the switch year model of Table B.4 reveals that some switch firms build up liquid assets commensurate with the size of their expansion.

B.2 Empirical Results Consistent With Agency Theory

This section will discuss empirical results related to the agency theory variables: debt capacity, earnings performance, and political visibility. These results are to an extent different from those reported in Chapter VI, but still consistent with agency theory.

Table B.9
Correlation Matrix for Switch and Matched Nonswitch Firms--Switch Year[a]

	LY_1	LY_2	EX_1	EX_2	LY_1*EX_1	LY_1*EX_2	LY_2*EX_1	LY_2*EX_2	PPP	DC_1	DC_2	EP_1	EP_2	LTA	IR
LY_1	1.00 0.00	0.65 0.01	0.05 0.61	0.23 0.02	0.19 0.05	0.56 0.01	0.18 0.08	0.47 0.01	0.05 0.62	-0.19 0.06	-0.22 0.02	0.34 0.01	0.34 0.01	-0.32 0.01	-0.09 0.37
LY_2		1.00 0.00	0.04 0.69	0.16 0.12	0.15 0.15	0.39 0.01	0.20 0.04	0.55 0.01	0.15 0.13	-0.29 0.01	-0.34 0.01	0.23 0.02	0.25 0.01	-0.13 0.21	-0.10 0.34
EX_1			1.00 0.00	0.78 0.01	0.97 0.01	0.66 0.01	0.96 0.01	0.64 0.01	0.06 0.53	0.03 0.73	-0.13 0.21	0.13 0.21	0.07 0.46	-0.05 0.60	-0.21 0.04
EX_2				1.00 0.00	0.77 0.01	0.88 0.01	0.79 0.01	0.89 0.01	0.23 0.02	-0.20 0.05	-0.37 0.01	0.27 0.01	0.23 0.02	-0.14 0.17	-0.23 0.02
LY_1*EX_1					1.00 0.00	0.74 0.01	0.97 0.01	0.70 0.01	0.06 0.53	-0.005 0.95	-0.15 0.13	0.16 0.12	0.11 0.26	-0.08 0.41	-0.20 0.04
LY_1*EX_2						1.00 0.00	0.73 0.01	0.91 0.01	0.19 0.06	-0.25 0.01	-0.37 0.01	0.32 0.01	0.28 0.01	-0.20 0.05	-0.21 0.03
LY_2*EX_1							1.00 0.00	0.74 0.01	0.06 0.51	-0.01 0.92	-0.17 0.09	0.19 0.07	0.15 0.15	-0.06 0.53	-0.19 0.07
LY_2*EX_2								1.00 0.00	0.25 0.01	-0.30 0.01	-0.45 0.01	0.32 0.01	0.31 0.01	-0.14 0.18	-0.20 0.05
PPP									1.00 0.00	-0.20 0.05	-0.39 0.01	0.01 0.86	0.01 0.88	0.13 0.21	0.13 0.21
DC_1										1.00 0.00	0.86 0.01	-0.04 0.67	-0.05 0.62	0.12 0.25	0.02 0.81
DC_2											1.00 0.00	-0.13 0.21	-0.12 0.25	0.16 0.11	0.13 0.18
EP_1												1.00 0.00	0.96 0.01	-0.19 0.05	0.03 0.72
EP_2													1.00 0.00	-0.17 0.10	0.07 0.49
LTA														1.00 0.00	0.32 0.01
IR															1.00 0.00

[a] Spearman correlation coefficient and significance level.

Debt capacity (DC_1) is another significant variable observed in the models for the switch year shown in Tables B.5 and B.6. The positive association between the decision to switch and debt capacity indicates that the higher the measure, the lower the debt capacity, and the higher the probability that a firm will switch actuarial cost methods.

Earnings performance (EP_1), on the other hand, is not significant in any of the models shown in Tables B.3 through B.6 both in the year prior to the switch and the year of the switch. The earnings performance measure for the year of the switch, though, automatically incorporates the effects of the switch. Hence, a difference may have existed between the two groups of firms if the switch had not taken place.

The natural logarithm of total assets (LTA), which is used as a surrogate for expected political visibility costs, is significant in the models for the switch year shown in Tables B.4 and B.6 at the 0.1 level of significance. The negative sign of the relevant coefficient indicates that the smaller the firm the higher the probability that it will switch to an asset increasing actuarial cost method.

These results indicate that during the switch year the debt capacity of switch firms is low. Hence, switch firms may experience certain agency costs, e.g., costs of renegotiation or technical default. The switch of actuarial cost methods may represent an attempt to avoid these costs and benefit both stockholders and bondholders. The improvement in earnings performance, though present due to the mechanics of accounting, does not allow any differentiation between switch and nonswitch firms. The possibility, however, that management of switch firms may have benefited from higher earnings still remains. Finally, the lower political visibility of switch firms has definitely facilitated the switch of actuarial cost methods that increases both assets and earnings.

B.3 Incremental Explanatory Power of One Theory Over the Other

The incremental explanatory power of one theory over the other is investigated by performing tests similar to those suggested in Section 6.4. Tests for the year prior to the switch, based on the variables of Tables B.3 and B.4, reveal that only "pecking order" theory can explain the switch. This is also the case for the year of the switch in Tables B.3 through B.6. In Table B.6, though, the agency theory variables as a group are also significant in a model that already includes PPP, IR, and the "pecking order" variables.

B.4 Explanatory and Predictive Abilities of the Models

As in Chapter VI, the explanatory power of the logit models is evaluated on the basis of the percentage of correctly classified firms. This percentage varies from

58.0% to 72.2%, across models. Significant models, in general, perform better than statistically insignificant models.

The predictive ability of the theory is also evaluated by following a jacknife logit approach. A full model for the switch year as the one in Table B.3 is used as a basis for the predictions. According to this model, 64.4% of the observations were predicted correctly.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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